SFIM-AEC-RP-CR-97056

Tooele Army Depot

Revised Final Site-Wide Ecological Risk Assessment

Volume I

February 1998

Rust Environment and Infrastructure
Grand Junction, Colorado 81506

Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010-5401
under
Contract DAAA15-90-D-0007

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This revised final report presents the results of the site-wide ecological risk assessment (SWERA) at the Tooele Army Depot (TEAD). This SWERA addresses 56 Solid Waste Management Units (SWMUs) regulated under the Federal Facilities Agreement, the Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). TEAD is a National Priorities List site under CERCLA and is under a corrective action permit issued by the State of Utah. The need to perform a SWERA was identified based on the conclusions and recommendations in various TEAD reports, and in order to maintain regulatory compliance under CERCLA and the National Contingency Plan. The purpose of this SWERA report is to characterize and evaluate the TEAD ecosystem in order to determine whether site contamination is causing, or has the potential to cause, adverse effects to the local ecology. This document consists of the SWERA report (Volume I) and all of the supporting data (Volumes II, III, and IV).

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Acronyms and Abbreviations

AED	Ammunition and Engineering Directorate
AFM	assimilation efficiency
AOC	area of concern
ARAR	applicable or relevant and appropriate requirement
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	area use factor
BAF	bioaccumulation factor
BCF	bioconcentration factor
BLM	Bureau of Land Management
BRAC	Base Realignment and Closure
CAP	Corrective Action Permit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CLP	Contract Laboratory Program
CMS	Corrective Measures Study
CoC	chain of custody
COPC	chemical of potential concern
CRDL	Contract Required Detection Limit (CLP)
CRL	certified reporting limit
Cterm	concentration term
CWP	Contaminated Waste Processor
DataChem	DataChem Laboratories
dbh	diameter at breast height
DIR	daily dietary intake
DOT	Department of Transportation
DQA	Data Quality Assessment
DQO	Data Quality Objective
DRMO	Defense Reutilization and Marketing Office
dup	duplicate
DV	data validation
EMF	Ecological Magnification Factors
EPC	Exposure Point Concentration
ESA	ecological study area
ETAG	Ecological Technical Assistance Group
FFA	Federal Facilities Agreement
FS	Feasibility Study
GAC	granular activated carbon
GC/MS	gas chromatography/mass spectrometry
GE	greater than or equal to
GFAA	graphite furnace atomic absorption
gpd	gallons per day
GPS	Global Positioning System
HE	high explosive
HEAST	Health Effects Assessment Summary Tables

HES	Hazleton Environmental Services, Inc.
HI	hazard index
HQ	hazard quotient
HSDB	Hazardous Substance Data Base
ICP	inductively coupled plasma
IDL	instrument detection limit
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information System
IWL	Industrial Waste Lagoon
IWTP	Industrial Wastewater Treatment Plant
K_{EL}	elimination rate
KS	Kolmogorov-Smirnov
KW	Kruskal-Wallis
LCS	laboratory control sample
LD50	fifty percent lethal dose
LDLo	lethal dose-low
LEL	lowest effects level
LOAEL	lowest observed adverse effects level
LOEL	lowest observed effects level
LT	less than
MATC	maximum acceptable tissue concentration
MDL	method detection limit
MDRD	minimum detectable relative difference
μg/g	micrograms per gram
μg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
MW	Mann-Whitney
NAA	no action alternative
NCP	National Contingency Plan
NCR	Nonconformance Report
ND	nondetect
NEL	no effect level
ng/kg	nanograms per kilogram
NIST	National Institute of Standards and Technology
NOAEL	no observed adverse effects level
NOEL	no observed effects level
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NWI	National Wetlands Inventory
OB/OD	Open Burn/Open Detonation
OCPs	organochlorine pesticides
OIWL	Old Industrial Waste Lagoon
OU	operable unit

PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PETN	pentaerythritol tetranitrate
PPE	personal protective equipment
ppb	parts per billion
ppm	parts per million
ppt	parts per trillion
PRG	preliminary remediation goal
PRI	Potomac Research, Inc.
QAPjP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RA	remedial action
RAGS	Risk Assessment Guidance for Superfund
RAS	Routine Analytical Services
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RDX	cyclonite
RFI	RCRA Facility Investigation
RFP	request for proposal
RI	Remedial Investigation
RMA	Rocky Mountain Arsenal
RME	reasonable maximum exposure
ROD	Record of Decision
RPD	relative percent difference
RSA	reference study area
RTECs	Registry of Toxic Effects of Chemical Substances
Rust E&I	Rust Environment and Infrastructure
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SDG	sample delivery group
SMDP	Scientific/Management Decision Point
SOP	standard operating procedure
SRM	standard reference material
SS	Special Status
SVOC	semi-volatile organic compound
SWEAP	Site-Wide Ecological Risk Assessment Work Plan
SWERA	Site-Wide Ecological Risk Assessment
SWMU	solid waste management unit
TBV	toxicity benchmark value
TDLo	toxic dose-low
TEAD	Tooele Army Depot
TEF	Toxicity Equivalency Factor
TLI	Triangle Laboratories of Research Triangle Park, Inc.
TNT	2,4,6-trinitrotoluene

TPHC	total petroleum hydrocarbon
TSCA	Toxic Substances Control Act
UBC	upper bound concentration
UCL	upper confidence level
UF	uncertainty factor
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound
WOE	Weight of Evidence
WP	white phosphorous
W test	Shapiro-Wilks (W) test

EXECUTIVE SUMMARY

This revised final Tooele Army Depot (TEAD) Site-Wide Ecological Risk Assessment (SWERA) report addresses a total of 56 solid waste management units (SWMUs) regulated under the Federal Facilities Agreement (FFA), the Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). TEAD is a National Priorities List (NPL) site under CERCLA. In addition, TEAD is under a corrective action permit issued by the State of Utah. A Remedial Investigation/Feasibility Study (RI/FS) is being conducted for 17 CERCLA sites in 7 operable units (OUs). RCRA Facility Investigation/Corrective Measure Studies (RFI/CMS) are also underway for nine known releases SWMUs, eight Group A suspected releases SWMUs, nine Group B suspected releases SWMUs, nine Group C Base Realignment and Closure (BRAC) parcel SWMUs, and two areas of concern (AOCs) included in Group B SWMUs. The TEAD SWMUs, plus 2 areas of concern (AOCs), actually represent 63 separate TEAD locations. SWMUs 1, 1d, 1b, and 1c are contained within SWMU 1. SWMUs 12 and 15 are located adjacent to one another; however, the boundaries have never been completely established and, as such, are treated together as a composite location.

Based upon the conclusions and recommendations in the various RI/RFI reports, and in order to maintain regulatory compliance under CERCLA and the National Contingency Plan (NCP), the need to conduct a site-wide ecological risk assessment was identified. The SWERA was conducted to characterize and evaluate the TEAD ecosystem in order to determine whether site contamination is causing, or has the potential to produce excessive risks, or to cause adverse ecological effects.

TEAD is located adjacent to the town of Tooele, Utah, approximately 35 miles southwest of Salt Lake City. The facility has been a major ammunition storage, and vehicle and equipment maintenance facility since 1942. The facility, which covers 24,732 acres, has had a variety of known or potential waste and spill sites identified through previous environmental investigations. In 1990, TEAD was added to the NPL, which is regulated under the Superfund Program (CERCLA). As a result, 17 of the 46 previously identified sites were placed under the Superfund Program, while the other 29 SWMUs remained under the RCRA Corrective Action Permit (CAP). These 29 SWMUs were further divided into 20 suspected release SWMUs and 9 known release SWMUs. Since the CAP was issued, 10 additional suspected release SWMUs were identified and added, bringing the total number of SWMUs at TEAD to 56. Four AOCs were added since the summer of 1995, of which 2 (old AOCs-1 and -2) were just recently changed to SWMU status which are included in the 56 SWMUs.

In 1993, TEAD was placed on the list of facilities scheduled for BRAC. Realignment activities began in October 1993 and were completed in June 1997. Under BRAC, the vehicle and equipment maintenance and storage functions were transferred to the Red River Army Depot in Texas. Conventional ammunition storage will continue at TEAD. Portions of the CERCLA OUs, and some of the RCRA SWMUs, have been included in the BRAC portion of TEAD.

Rust Environment and Infrastructure (Rust E&I) was tasked with conducting the SWERA under USAEC Contract DAAA15-90-0007, Modification 3 to Task Order 0003 in September 1994. This report details the objectives, the technical approach and procedures used, and the results of the investigation. An assessment of data quality, an evaluation of potential adverse effects or risks to the environment, and conclusions are also presented.

The U.S. Army Environmental Center (USAEC), formerly the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), holds management responsibility for the SWERA. Representatives from the USAEC, TEAD, the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM, formerly the U.S. Army Environmental Hygiene Agency), the State of Utah, the U.S. Environmental Protection Agency (USEPA) Region VIII, the U.S. Fish and Wildlife Service (USFWS), and Rust E&I formed an Ecological Technical Assistance Group (ETAG). The ETAG met on several occasions to discuss revisions to the work plan, which were incorporated into the final version of that document (SWEAP/QAPjP, Rust E&I 1994c). That final version reflected consensus gained through meetings and correspondence. It also incorporates comments received from the USAEC and the various regulatory agencies since completion of the Fall 1994 fieldwork. Final approval for the work plan was received in April 1995.

The field activities identified in the work plan took place from September through October 1994, and during September and October of 1995, during which time biota sample collection (vegetation, jackrabbits, and terrestrial invertebrates) for chemical analysis, small mammal trap and release, and qualitative and quantitative vegetation and wildlife population surveys were performed. In addition, sediment samples from the SWMU 14 Sewage Lagoons were examined for types and quantities of benthic invertebrates. Due to the lateness of the 1994 sampling period, and unusually dry weather conditions resulting in sparse vegetation, collection of terrestrial invertebrates (grasshoppers and beetles) had to be postponed until the fall of 1995. However, due to unseasonably warm winter weather in early 1995, most grasshopper eggs did not survive to hatch during the spring. This resulted in an abnormally low abundance of grasshoppers for collection during the fall of 1995.

The SWERA focused on the receptors most likely to be highly exposed, the most significant exposure pathways, and the most contaminated areas of TEAD in order to optimize the likelihood of identifying any adverse effects. The SWERA had three phases that related to the retrospective risk assessment model described by the USEPA (1992d). Phase I focused on problem formulation; Phase II activities focused on the measurement and estimation of exposure effects; and Phase III activities characterized the risk. The conceptual framework of the SWERA relates to the USEPA data quality objectives (DQOs) guidance (USEPA 1993b), which require problem definition, data inputs and decision logic, limits of decision error, and optimization of a sampling and analysis plan. Where possible, the SWERA also incorporated guidance obtained from the U.S. Army's ERA publications, *Procedural Guidelines for Ecological Risk Assessment at U.S. Army Sites, Volumes I and II* (December 1994, February 1995). Since the beginning of the SWERA in late 1993, the USEPA has published more recent guidance for conducting ecological risk assessments, (e.g., *Proposed Guidelines for Ecological Risk Assessment*; Federal Register, FRL-5605-9, 9/9/96, and *Ecological Risk*

Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final, 6/5/97). The majority of key elements in the newer guidance documents have been incorporated in the TEAD SWERA. One such component in the newer guidance is the "8-Step Ecological Risk Assessment Process for Superfund" which includes scientific management decision points (SMDPs). These SMDPs chart agreement on key decisions (e.g., selection of endpoints and receptors, conceptual site models, food web models, etc.) and govern the direction in the ERA process. Although not addressed as SMDPs per se in this document, the substance of such elements was achieved in this SWERA through the input and consensus-building process of the ETAG. Phase I focused on problem formulation. Field reconnaissance trips, which included qualitative and semi-quantitative flora and fauna surveys, were conducted in May and June 1994 to provide the basis for selecting key exposure pathways and receptor species, ecological study areas (ESAs), assessment endpoints, and the development of a conceptual site model.

The SWERA work plan proposed the concept of ecological study areas (ESAs) to represent the many TEAD SWMUs. Such an approach was intended to focus and optimize the sampling and analysis efforts towards known areas of contamination which contained ecological habitats representative of the entire TEAD facility. The ESAs were selected SWMUs grouped together based on similarities in habitat, proximity to one another, contamination, and biotic species. A total of three ESAs, two terrestrial and one aquatic, were established. ESA-1 (SWMUs 42/45) represented ecological habitat at the edge of the Maintenance and Administrative Area; ESA-2 consisted of SWMUs 1b/1c, 10/11, 12/15, and 21/37, which provided a greater distribution of ecological habitat and contaminant types relative to ESA-1. ESA-3 represented the aquatic ecosystem (SWMU 14 Sewage Lagoons). In addition, a reference study area (RSA)—which was similar to TEAD in terms of topography, wildlife, vegetation, climate, and soil type—was selected. The RSA is located approximately 5 miles due south of TEAD.

The TEAD conceptual site model included four major release mechanisms—wind, biotic uptake, surface runoff, and tracking. Key receptors representing terrestrial and aquatic pathways, some of which are protected or endangered species, consisted of passerine birds, shorebirds and waterfowl (mallard duck), and raptors, including the golden and bald eagles, the great horned owl, and the American kestrel. Mammalian key receptors included the deer mouse, mule deer, jackrabbit, and the kit fox. Plants and soil fauna represented ecological receptors whose contact with potentially contaminated soil could produce unacceptable risks.

The dominant habitat at TEAD consists of a mixture of disturbed sagebrush community and grasslands, with a few localized areas of riparian/wetland habitat. Vegetation communities at TEAD are strongly influenced by physical disturbance, such as grazing. The habitat at the RSA consists primarily of mixed sagebrush and juniper, with less anthropomorphic and grazing disturbance than at TEAD.

Following investigative field activities in Phase I, assessment and measurement endpoints were selected. Assessment endpoints are components or values of the ecosystem that are worthy of protection. At TEAD, protection of waterfowl, migratory birds, and Special Status species (i.e., golden and bald eagles) was considered crucial. Mule deer were considered important as

a game animal. The measurement endpoints, which allow quantification of the assessment endpoints, included chemical concentrations in biota tissue, soil, surface water, and sediment, as well as small mammal and vegetation population parameters such as species density and diversity. The USEPA DQO guidance was interwoven throughout the SWERA and was incorporated into the evaluation of measurement and assessment endpoints.

Screening of TEAD historical data for chemicals of potential concern (COPCs) for soil, sediment, and surface water, followed USEPA guidance and incorporated comments and approaches suggested by USEPA Region VIII toxicologists and members of the ETAG. In order to simplify the process, the screening took place on two separate databases, one including soil and sediment from 0-to-2 feet below ground surface, and the other containing only surface water. In order to proceed with the soil and sediment database screening, a selected TEAD background sample set was established using upper bound concentrations (UBCs) against which the entire TEAD historical soil and sediment database was screened. The background soil UBC was generally equal to the arithmetic (or geometric) mean plus two arithmetic (or geometric) standard deviations. If a particular analyte record was less than the UBC, it was removed from further consideration. Records containing NDs ("non-detects") or LTs ("less thans") were further evaluated by dividing the certified reporting limit (CRL) by 2; all subsequent data records were then screened against a detection frequency of greater than or equal to 5 percent.

A preliminary COPC list consisting of 53 analytes, which formed the basis for the biota analyses, and an interim final COPC list of 118 analytes were developed during the original Fall 1994 data screening. Following a subsequent review of the TEAD database in 1996, approximately 20,000 records, previously omitted due to missing key database field information, were included. Another screening of the database took place in July 1996 and produced a list of 124 COPCs (Final COPC list). An additional COPC screening took place in October 1997 which reduced the COPC list to 122 COPCs (Revised Final COPC list). Quantitative risk calculations were conducted on the basis of the Revised Final COPC list; a qualitative evaluation of several other COPCs from that list (pH, anions, dibenzofuran, pentaerythritol tetranitrate (PETN), and volatile organic compounds (VOCs)) has been included. Surface water data at TEAD were limited and, as such, COPC screening included all of the valid data records. Data collected at TEAD after the Fall 1994 historical data compilation were not included in this SWERA.

Toxicity benchmark values (TBVs) were derived from published toxicity data, and evaluated by the USEPA screening criteria with input from the USEPA Region VIII toxicologists. Due to the lack of available toxicity data, it was necessary to utilize the same TBV for many compounds in the same chemical class (e.g., dioxins/furans, some pesticides/PCBs, phthalates, and some semivolatile organic compounds (SVOCs) and VOCs). Soil half-lives were calculated on remaining VOCs for which no toxicity data were available; the results indicated that negligible amounts of VOCs would remain in the 0-to-2-foot soil profile since the time the database was first screened in October-November 1994. Approval was given to Rust E&I by the USEPA (ETAG 1996) to evaluate the VOCs in a qualitative manner. Following discussions with the ETAG and direction from the Region VIII USEPA, uncertainty factors

(UFs) were incorporated into the final TBVs to adjust for intertaxon and Special Status (SS) species uncertainty, toxicity study duration, and study endpoint uncertainties. Toxicity equivalency factors (TEFs) were also applied to the dioxins and furans to adjust for individual toxicity relative to tetrachlorodibenzo-p-dioxin (TCDD), which is the most toxic chemical in this class of compounds.

Phase II activities focused on the measurement and estimation of potential exposure and effects on key receptors at TEAD. Quantitative surveys of small mammal population and community characteristics were conducted at each ESA and the RSA to evaluate potential effects from exposure to TEAD contaminants. Quantitative vegetation transects were also taken to evaluate habitat and possible effect of COPCs on vegetation. Biota tissue collection and analysis were conducted, providing the basis for estimation of exposure and providing inputs into the terrestrial food web model. Biota samples from TEAD were taken from known areas of highest COPC concentrations. The TEAD biota samples included three species of vegetation at both terrestrial ESAs, one ambrosia sample from SWMU 37 (ESA-2), and jackrabbits at one terrestrial ESA. Three types of vegetation plus jackrabbits were collected at the RSA. Collection of grasshoppers and beetles was delayed until the late summer of 1995 due to a shortage of sample material available in the fall of 1994. Soil samples were collected at vegetation sample locations. Existing analytical results from sediments and surface water (Montgomery Watson 1992, SAIC 1994) taken from the aquatic ESA (SWMU 14 Sewage Lagoons) were used in the characterization of risk for that location. Analytical results from soil and biota samples taken from the terrestrial ESAs were compared to results from those taken from the RSA to determine where differences in data distributions existed. The terrestrial and aquatic analytical data were then used to estimate potential adverse effects to higher level consumers.

The sampling and analysis plan, as identified in the work plan for Phase II, provided survey guidelines, rationale, procedures, numbers of samples to be taken, sample locations, and analytical considerations. The vegetation and small mammal surveys utilized a grid-based random number sampling approach to ensure objectivity and to avoid violating the assumptions of parametric statistical analysis. The biota tissue sampling utilized a biased approach by collecting samples in close proximity to the highest COPC concentrations observed in the previous RCRA RFI and CERCLA RI investigations in order to ensure that maximum tissue concentrations were observed. The soil samples were collected as close as practical to the vegetation sample locations, which served to reduce temporal and spatial uncertainty and provide a check against results from previous investigations. The vegetation species sampled represented a significant food source for the primary consumers (herbivores). The jackrabbits, grasshoppers, and beetles provide significant food sources for higher level consumers. Jackrabbits were taken at SWMU 45, but not in nearby SWMU 42, since they were much more abundant at SWMU 45. Soil samples were collected at the RSA wherever plant samples were taken. One ambrosia sample was collected at SWMU 37 and chemically analyzed due to a lack of other suitable vegetation species in the area. Ambrosia was not found at the RSA so no data are available for comparison for this matrix. Due to the low numbers of grasshoppers available for collection, ground-dwelling beetles were also collected. Samples of beetles were composited with other beetles from the other SWMU included in that SWMU grouping (i.e.,

SWMU 10 beetles were composited with SWMU 11 beetles to obtain one or more SWMU 10/11 beetle samples). This same procedure was followed for the grasshopper samples.

The collection and analysis of biota samples necessitated specialized laboratory procurement and method detection limit (MDL) studies, as well as analytical method modification in order to obtain defensible analytical data. Based upon the initial screening for COPCs and an evaluation of chemical toxicity and potential for bioaccumulation, selected biota analytes included 18 metals; 2 explosives (RDX (cyclonite) and 2,4,6-trinitrotoluene (2,4,6-TNT)); 6 polynuclear aromatic hydrocarbons (PAHs); 1 herbicide (2,4-dichlorophenoxyacetic acid); 2 organochlorine pesticides (p,p-DDE (2,2-Bis(p-chlorophenyl)-1,1-dichloroethene) and p,p-DDT (2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane)); and dioxins/furans. All of the analytical methodology followed modified USEPA SW-846 procedures and incorporated rigorous USEPA Contract Laboratory Program (CLP) Level IV/V quality assurance/quality control (QA/QC) requirements.

Co-located soil samples were analyzed for metals, explosives, pesticides/PCBs, SVOCs, and dioxins/furans according to established program requirements under the 1990 USATHAMA PAM 11-41 QA/QC manual, using USAEC performance-demonstrated laboratories.

Phase III activities focused on the toxicity assessment and risk characterization, including food web modeling, and were dependent on the results from Phase II. Bioaccumulation factors (BAFs) were calculated by dividing the concentration in the key receptor by the corresponding soil concentration at that location. A dynamic food web model was developed which simulated exposure over time, and provided estimated tissue concentrations based upon changing environmental concentrations or exposure conditions. The model was calibrated using the RSA data, and the predicted versus actual outputs of this model were compared. Conservative input assumptions were used to ensure success in detecting the presence of, or potential for, adverse effects. Models were developed for eight metals (antimony, barium, cadmium, copper, lead, mercury, selenium, and zinc), two organochlorine pesticides (ppDDT and ppDDE), two explosives (2,4,6-trinitrotoluene (246TNT) and RDX (cyclonite)), and four dioxins/furans (total TCDD, octachlorodibenzodioxin (OCDD), total tetrachlorodibenzofurans (TCDF), and total heptachlorodibenzodioxins (HPCDD)). Total TCDD, total TCDF, and total HPCDD model concentrations were also used to represent the concentration terms for TCDD, TCDF, and HPCDD, respectively. The model outputs for dietary concentrations of these analytes in biota were applied at all of the ESA SWMUs where dietary ingestion data were unavailable since biota were not collected at every location.

The risk characterization used the results of the exposure analysis to predict potential risk to ecological receptors. Hazard quotients (HQs) were calculated by dividing exposure by the TBV selected from literature and adjusted for uncertainty. Hazard indices (HIs) were also calculated by summing the analyte-receptor-pathway-specific HQs. HQs and HIs were calculated for three data sets: (1) TEAD historic soil and sediment data including soil data collected at the ESA SWMUs; (2) TEAD current, co-located soil and biota data from the ESA SWMUs; and (3) TEAD current co-located soil and biota evaluated on an ESA basis. The limited historic surface water data were added to all three data sets in order to address the

surface water ingestion pathway. Due to the limited air modeling data available, and very low HQs/HIs calculated for that pathway, those risks were evaluated separately from the soil ingestion, direct soil contact (for plants and soil fauna only), surface water, and dietary ingestion pathways. When the HQs or HIs exceed 1, potential risk to certain receptors may be indicated. Very high HQs and HIs indicate a higher likelihood of adverse effects, and require further evaluation.

Uncertainty in the risk assessment process was analyzed to identify limitations in the interpretation of the historical and current analytical and biometric results as well as the risk characterization. A weight-of-evidence (WOE) analysis (Section 7.4.3) was developed to support the conclusions reached in the SWERA.

Based upon the assessment of the analytical and biometric data, and evaluation of the final risk calculations, most locations at TEAD do not present a significant ecological risk to the birds and mammals that reside at or utilize the facility. The biometric data (i.e., habitat structure, population abundance and diversity) showed a strong association with physical disturbance and support the conclusions that the assessment endpoints are not being measurably impacted by chemical contamination at most TEAD locations.

Only seven SWMUs indicate the potential for unacceptable or excessive ecological risks (i.e., SWMUs 1/1d, 8, 10, 11, 12/15, 21, and 42). The remaining SWMUs and two AOCs indicate low or moderate potential for ecological risk. Table ES-1 presents a summary of the potential risks at each of the sites. The HIs for the TEAD SWMUs were compared to the RSA HIs, and the ratio of these HIs formed the primary basis for categorization of risk. Other factors, such as the numbers and types of receptors exhibiting risk, the number and types of COPCs driving the risk, biometric data, and *absolute* risk values were considered before arriving at a final conclusion. "Absolute" risk, in contrast to "relative" risk, disregards the comparison of the TEAD results to the RSA. Risks attributed solely to plants and soil fauna were deemed insufficient to categorize a site as having the potential for unacceptable ecological risk due to the large uncertainty in the toxicity data for those receptors. Figure ES-1 (also provided in Section 7.7) provides a graphical representation of those SWMUs that have the potential for unacceptable ecological risks.

There are no apparent risks to any receptor due to ingestion of surface water at SWMUs 11, 21, 23, and 45. These locations were the only terrestrial SWMUs where surface water was accessible to wildlife. Data from within buildings, sewers, and enclosed holding tanks or sumps were not evaluated.

Although there were some HQs and HIs greater than 1 for shorebirds and ducklings at SWMU 14 (Sewage Lagoons), this site does not pose a significant ecological risk through ingestion of surface water or sediments by the wildlife using that area. SWMU 14 provides an important water and food source to a variety of shorebirds and waterfowl that utilize the area on a regular basis.

A limited amount of air modeling data for VOCs was available at SWMUs 1, 10/11, 12/15, and 29/30; these data were evaluated in the risk assessment but were not added to the soil,

surface water, or dietary ingestion pathways due to the extremely low HQs calculated. No apparent risk exists for this pathway for burrowing mammals (i.e., deer mice and the kit fox).

A table listing the conservative parameters and assumptions used in the SWERA is included in Section 7.6.1 (Table 7-83). Most of the conservative assumptions or parameters were associated with the calculation of dietary intakes and the ingestion of surface water.

Although there are localized areas that may pose a hazard to some receptors, no apparent site-wide deleterious ecological effects have been identified at TEAD as a result of this baseline risk assessment. Differences in community structure between TEAD and the RSA are to be expected because TEAD has greater impacts resulting from human activities than does the RSA.

This document comprises eight sections (Volume I) and nine appendices (Volumes II, III, and IV). Section 1.0 presents the background and history of TEAD, SWMU summaries, general habitat, and physical and ecological characteristics. Section 2.0 presents the approach and methodology, which include a risk assessment process overview, the DQO process, and pre-field activities such as background evaluation and COPC screening. In addition, this section presents key receptor selection, selection of endpoints, and selection of the ESAs and the RSA. A discussion of the qualitative and quantitative field surveys, selection of sampling locations, and deviations from the work plan are presented in Section 3.0. Section 4.0 addresses the analytical program summary and data quality assessment. All of the current soil and biota sample results, comparisons of analyte concentrations in soil relative to biota concentrations, and a statistical evaluation of the RSA data are summarized in Section 5.0. Section 6.0 presents the results of the field wildlife and vegetation surveys.

The entire ecological risk assessment, which includes both the terrestrial and aquatic ecosystems, is located in Section 7.0. Section 7.5 presents the aquatic ecosystem risk assessment (SWMU 14 Sewage Lagoons) in its entirety, whereas terrestrial risks are addressed in Sections 7.2 and 7.4. Included in Section 7.0 are sections that discuss problem formulation, exposure analysis, stress response analysis, toxicity assessment (Section 7.3), uncertainty analysis (Section 7.6), and risk characterization/risk description for both terrestrial and aquatic ecosystems (Section 7.7). Food web modeling is also presented in this section (Section 7.2.2.4). An overall programmatic evaluation of the SWERA relative to the DQO process is provided in Section 7.4.4, a WOE analysis in Section 7.4.3, and an uncertainty analysis (Section 7.6). Table 7-87 includes details on ecological risk assessment results and conclusions. Tables 7-88 through 7-128 provide a risk description and interpretation, risk drivers, and ecological relevance on a SWMU-by-SWMU (current and historic data) and ESA (current data only) basis. References are located in Section 8.0.

The appendices (A through I) contain complete analytical data tables for co-located soil and biota samples, external data validation and internal data quality assessment (DQA) sections, a summary of the biota MDL studies, biological profiles for key receptor species, and a variety of risk assessment-related tables and graphic figures. A list of acronyms and abbreviations follows the table of contents.

Table ES-1. Summary of TEAD SWMU-Specific SWERA Conclusions

SWMU[a]	Description	Conclusions	Comments
1/1d	Open Burn/Open Detonation (OB/OD)	Site poses potential for unacceptable ecological risk	Due to active status, cleanup deferred to RCRA[b] closure.
1b/1c	OB/OD (Burn Pads/Trash Burn Pits)	Low ecological risk.	
2 (See note)	Industrial Waste Lagoon	Low ecological risk	Surface cleanup/closure complete.
3	X-Ray Lagoon	Low ecological risk	Small SWMU size precludes ecological habitat.
4	Sand Blast Area	Low ecological risk	Small SWMU size precludes significant ecological habitat.
5	Pole Transformer PCB Spill	Low ecological risk	ROD[c] signed. Remediation complete.
6	Old Burn Area	Low ecological risk	Iron contributes significantly to the HIs[d] for ecological receptors.
7	Chemical Range	Low ecological risk	
8	Small Arms Firing Range	Site poses potential for unacceptable ecological risk	Possible human health remediation may mitigate ecological concerns.
9	Drummed Radioactive Waste Storage Area	Low ecological risk	ROD signed.
10	TNT Washout Facility	Site poses potential for unacceptable ecological risk	Remediation planned for human health risks. Include mitigation of ecological risks in CMS[e].
11	Laundry Effluent Ponds	Site poses potential for unacceptable ecological risk	Remediation planned for human health risks. Include mitigation of ecological risks in CMS.
12	Pesticide Disposal Area	Site poses potential for unacceptable ecological risk	Soil cover planned for SWMU 15 would reduce ecological risks.
15	Sanitary Landfill	Site poses potential for unacceptable ecological risk.	Soil cover planned to mitigate human health risk would reduce ecological risks.
13	Tire Disposal Area	Low ecological risk	
14	Sewage Lagoons	Low ecological risk	Possible future closure by filling with clean soil may mitigate ecological risks but may destroy ecological habitat.
17	Former Transformer Storage	Low ecological risk	ROD signed.
18	Radioactive Waste Storage Building (S-659)	Low ecological risk	ROD signed. Closure evaluation underway.
19	AED Demilitarization Test Facility	Moderate ecological risk	
20	AED Deactivation Furnace Site	Moderate ecological risk	Iron contributes significantly to the HIs for the ecological receptors.

Table ES-1. Summary of TEAD SWMU-Specific SWERA Conclusions (continued)

SWMU[a]	Description	Conclusions	Comments
21	AEC Deactivation Furnace Building	**Site poses potential for unacceptable ecological risk.**	Evaluate ecological risk drivers as part of CMS.
22	Building 1303 Washout Pond	Low ecological risk	Small SWMU size precludes significant ecological habitat.
23	Bomb and Shell Reconditioning Building	Moderate ecological risk	
24	Battery Pit	Low ecological risk	No ecological habitat.
25	Battery Shop	Low to moderate ecological risk.	Little or no ecological habitat.
26	DRMO Storage Yard	Low ecological risk	
27	RCRA Container Storage Area	Low ecological risk	Ecological risks low *except for* soil fauna whose toxicity values reflect high uncertainty.
28	90-Day Drum Storage Area	Low ecological risk	
29	Drum Storage Areas	Low ecological risk	
30	Old Industrial Wastewater Lagoon	Moderate ecological risk	
31	Former Transformer Boxing Site	Low ecological risk	
32	PCB Spill Site	Low ecological risk	
33	PCB Storage Building 659	Low ecological risk	ROD signed. Building closure evaluation underway.
34	Pesticide/Herbicide Storage Building	Moderate ecological risk	
35	Wastewater Spreading Area	Moderate ecological risk	
36	Old Burn Staging Area	Moderate ecological risk	
37	Contaminated Waste Processor	Moderate ecological risk	
38	Industrial Wastewater Treatment Plant	Low ecological risk	
39	Solvent Recovery Facility	Low ecological risk	No samples collected.
40	AED Test Range	Low ecological risk	
41	Box Elder Wash Drum Site	Low ecological risk	ROD signed. Remedial action complete.
42	Bomb Washout Building	**Site poses potential for unacceptable ecological risks.**	Remediation planned to remediate human health risks. Consider ecological risks as part of CMS.
43	P999 Container Storage Area	Low ecological risk	No samples collected.

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Table ES-1. *Summary of TEAD SWMU-Specific SWERA Conclusions (continued)*

SWMU[a]	Description	Conclusions	Comments
44	TCE Tank Storage	Low ecological risk	No samples collected.
45	Stormwater Discharge Area	Moderate ecological risk	
46	Used Oil Dumpsters	Low ecological risk	Minimal ecological habitat.
47	Boiler Blowdown Areas	Low ecological risk	Very limited ecological habitat.
48	Old Dispensary Discharge	Low ecological risk	Minimal ecological habitat.
49	Stormwater/Industrial Wastewater Piping	Low ecological risk	No ecological habitat.
50	Compressor Condensate Drain - Building 619	Low ecological risk	No ecological habitat.
51	Chromic Acid/Alodine Drying Beds	Low ecological risk	No ecological habitat.
52a	Possible Drain Field	Low ecological risk	BRAC [f] parcel
52b	Disposal Trenches	Low ecological risk	BRAC parcel
52c	Area Containing Charcoal Material	Low ecological risk	Qualitative evaluation concludes that some ecological risk may be present which is expected to be mitigated as part of human risk remediation.
52d	Horse Stable Area	Low ecological risk	Qualitative evaluation concludes that some ecological risk may be present which is expected to be mitigated as part of human risk remediation.
53	PCB Storage/Spill Sites	Low ecological risk	No ecological habitat.
54	Sandblast Areas	Low ecological risk	No ecological habitat.
55	Battery Shop - Building 618	Low ecological risk	No ecological habitat.
56 - old AOC-1	Gravel Pit	Low ecological risk	Qualitative evaluation concludes that some ecological risk may be present which is expected to be mitigated as part of human risk remediation.
57 - old AOC-2	Skeet Range in Administration Area	Low ecological risk	Qualitative evaluation concludes that some ecological risk may be present which is expected to be mitigated as part of human risk remediation.
AOC-3	Extraction Well 15	Low ecological risk	No further action recommended in RFI [g].
AOC-4	National Guard Training Site	Low ecological risk	No further action recommended in RFI.

Note.—Shaded rows represent SWMUs not included in quantitative risk assessment.
[a]Solid Waste Management Unit.
[b]Resource Conservation and Recovery Act.
[c]Record of Decision
[d]Hazard indices.
[e]Corrective Measures Study.
[f]Base Realignment and Closure.
[g]RCRA Facility Investigation.

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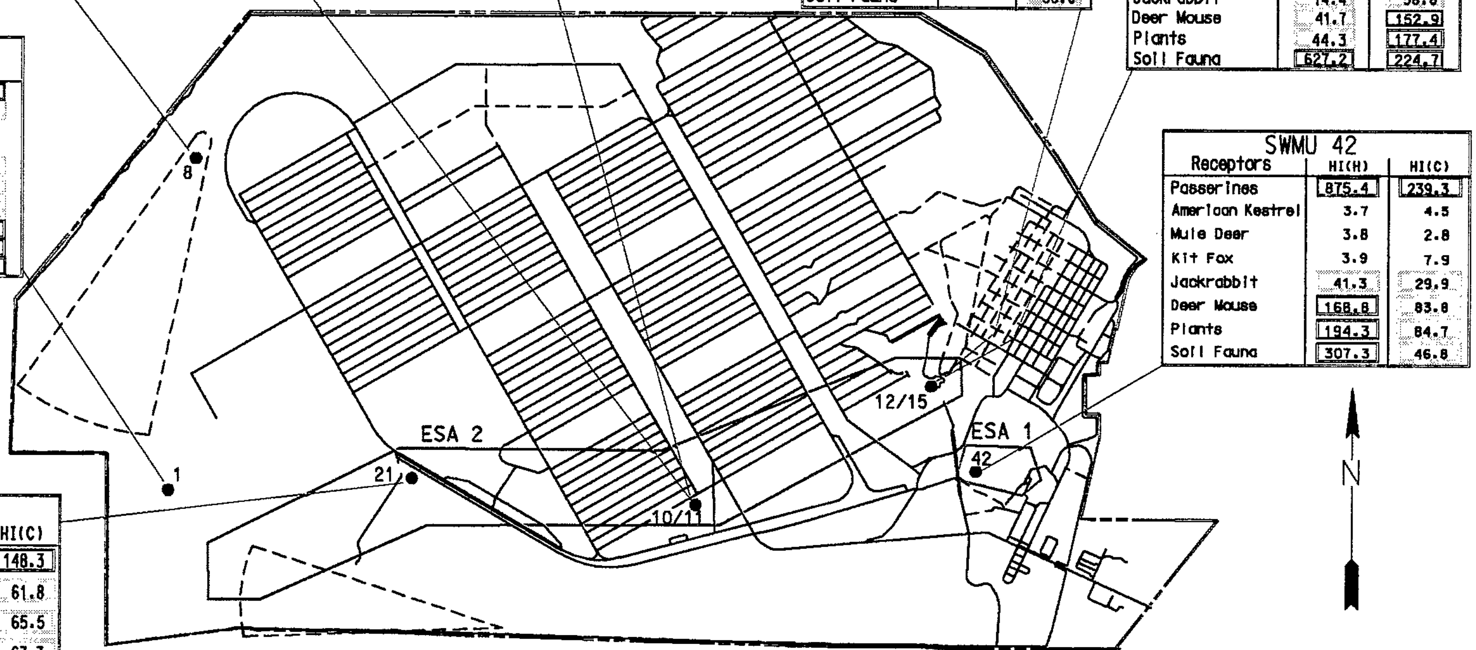

SWMU 8

Receptors	HI(H)
Passerines	304.8
Deer Mouse	65.8
Plants	35.3
Soil Fauna	83.8

SWMU 1

Receptors	HI(H)
Passerines	643.2
American Kestrel	19.9
Golden Eagle	1.3
Bald Eagle	1.3
Mule Deer	16.7
Kit Fox	15.4
Jackrabbit	53.0
Deer Mouse	186.8
Plants	605.6
Soil Fauna	200.0

SWMU 10

Receptors	HI(H)	HI(C)
Passerines	1.7	151.6
Mule Deer	-	4.8
Jackrabbit	-	52.4
Deer Mouse	35.8	543.2
Plants	137.2	30.2
Soil Fauna	-	24.9

SWMU 11

Receptors	HI(H)	HI(C)
Passerines	397.6	505.6
Kit Fox	-	1.4
Jackrabbit	3.6	4.4
Deer Mouse	130.1	175.2
Plants	100.0	55.2
Soil Fauna	233.1	120.3

SWMU 12

Receptors	HI(H)	HI(C)
Passerines	5.0	156.4
American Kestrel	-	2.3
Kit Fox	-	2.5
Jackrabbit	-	5.9
Deer Mouse	-	50.4
Plants	1.8	33.9
Soil Fauna	-	38.0

SWMU 15

Receptors	HI(H)	HI(C)
Passerines	211.7	366.7
American Kestrel	2.4	9.4
Mule Deer	1.3	5.4
Kit Fox	1.4	10.7
Jackrabbit	14.4	58.6
Deer Mouse	41.7	152.9
Plants	44.3	177.4
Soil Fauna	627.2	224.7

SWMU 42

Receptors	HI(H)	HI(C)
Passerines	875.4	239.3
American Kestrel	3.7	4.5
Mule Deer	3.8	2.8
Kit Fox	3.9	7.9
Jackrabbit	41.3	29.9
Deer Mouse	168.8	83.8
Plants	194.3	84.7
Soil Fauna	307.3	46.8

SWMU 21

Receptors	HI(H)	HI(C)
Passerines	1047.5	148.3
Deer Mouse	134.1	61.8
Plants	2024.3	65.5
Soil Fauna	3470.2	67.3

Range of Hazard Indices

- 100 to 1000
- 10 to 100
- 1 to 10

LEGEND

HI(H) - Hazard Indices (Historic)

HI(C) - Hazard Indices (Current)

ESA 1 ECOLOGICAL STUDY AREA

10/11 ● SWMU LOCATION

SWMU DESCRIPTIONS

1	OPEN BURN AREA
8	SMALL ARMS FIRING RANGE
10	TNT WASHOUT FACILITY
11	LAUNDRY EFFLUENT PONDS
12	PESTICIDE DISPOSAL AREA
15	SANITARY LANDFILL
21	AED DEACTIVATION FURNACE
42	BOMB WASHOUT BULDING

0 ½ 1
SCALE IN MILES

0 5000
SCALE IN FEET

Figure ES-1. Hazard Indices for TEAD SWMUs With Unacceptable or Excessive Ecological Risks

1.0 INTRODUCTION

Rust Environment and Infrastructure (Rust E&I) is conducting a Remedial Investigation/ Feasibility Study (RI/FS) for 17 solid waste management units (SWMUs) in 7 operable units (OUs) at Tooele Army Depot (TEAD) under Contract DAAA15-90-D-0007, Task Order 0003. As part of the RI/FS, Rust E&I prepared and submitted a Final RI Report for OUs 4 through 10 (Rust E&I 1994a). On the basis of the conclusions and recommendations in the Final RI Report and comments received from the U.S. Army Environmental Center (USAEC), the U.S. Environmental Protection Agency Region VIII (USEPA), and the State of Utah, the need was identified for additional investigations at 11 SWMUs in OUs 4, 8, and 9. In addition, the need to conduct a TEAD Site-Wide Ecological Risk Assessment (SWERA) was identified. The results of the SWERA are presented in this report and are based on information and data gathered in accordance with the Site-Wide Ecological Risk Assessment Work Plan/Quality Assurance Project Plan (SWEAP/QAPjP) issued in November 1994, with minor response to comments in February 1995. The final SWEAP/QAPjP was approved in April 1995.

TEAD is located adjacent to the town of Tooele, Utah, approximately 35 miles southwest of Salt Lake City as shown in Figure 1-1. The facility has been a major ammunition storage depot and vehicle and equipment maintenance facility since 1942. The facility, which covers 24,732 acres, has had a variety of known or potential waste and spill sites identified through previous environmental investigations.

The SWERA for TEAD includes a total of 39 Resource Conservation and Recovery Act (RCRA) and 17 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) SWMUs for a total of 56 SWMUs. The 39 RCRA SWMUs are further divided into two groups, the known and suspected releases sites. The 9 RCRA known releases SWMUs are shown in Figure 1-2; the 30 suspected releases SWMUs are shown in Figure 1-3; and the 17 CERCLA sites (which are also referred to as SWMUs in this document) are shown in Figure 1-4. Each of the 56 SWMUs is listed in Table 1-1 under its respective OU or under either the known releases SWMUs or the suspected releases SWMUs heading. Areas of concern—AOC-3 and AOC-4—are also included in Table 1-1 and are shown in Figure 1-3. These more recently identified areas of potential release are currently under investigation.

1.1 PROGRAM BACKGROUND

The current scope of the SWERA evolved through a series of work plan submittals, reviews, and revisions with input from the USAEC, the USEPA, the State of Utah, and other regulatory agencies being incorporated throughout the planning process.

A key step in the evolution was the USEPA Region VIII's establishment of an Ecological Technical Assistance Group (ETAG) with representatives from the following entities providing assistance in developing the work plan: USAEC, TEAD, USEPA, State of Utah, U.S. Fish and Wildlife Service (USFWS), U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM; formerly the U.S. Army Environmental Health Agency), and Rust E&I. As a result of the July 6, 1994 ETAG meeting, the scope of the SWEAP/QAPjP was modified. Based on discussions with key personnel representing these agencies and response to USEPA comments on the SWEAP/QAPjP, the August 1994 SWEAP/QAPjP represented a major revision in work scope from the March 1994 version.

The scope of work agreed upon by the ETAG included habitat evaluations; collection and analysis of co-located soils, vegetation, grasshopper, and jackrabbit samples; and evaluation of the benthic community in the sediment of the sewage lagoon (SWMU 14). These activities were conducted during September and October 1994. The grasshoppers were not located in quantities sufficient for sampling due to the unseasonably dry summer. Additional fieldwork for the collection of grasshoppers was delayed until the fall of 1995.

The laboratories selected to analyze the biota samples were HES, Inc. (HES) and Triangle Laboratories of Research Triangle Park, Inc. (TLI). These laboratories were approved by the USAEC following a formal review of analytical methods and corresponding quality assurance/quality control (QA/QC) protocols. Analysis of soil samples was performed by DataChem Laboratories (DataChem), a USAEC performance-demonstrated laboratory. Analysis of dioxins and furans in soil was subcontracted by DataChem to Pace Laboratories.

At a meeting with the ETAG held on April 26, 1995, the approaches to the TEAD background evaluation, the COPC screening process, and bioaccumulation models were presented. The attendees included representatives from the USAEC, USEPA Region VIII, State of Utah, USFWS, and Rust E&I. The approaches and models, as presented, were acceptable to the regulatory agencies; however, the USEPA recommended that Rust E&I develop an approach for reducing the list of chemicals of potential concern (COPCs) to a more manageable number. A proposal letter on a reduced list of COPCs was submitted to the USAEC, USEPA, State of Utah, and USFWS on behalf of TEAD by Rust E&I in July 1995. Following a telephone conference with the USAEC, TEAD, and the USEPA on July 20, 1995, the recommendations provided in that letter proposal were accepted. A TEAD correspondence (August 7, 1995) sent to the ETAG presented the results of that telephone conference call. As a result of these discussions and additional correspondence, the number of COPCs for which quantitative risk assessment was to be performed was consolidated to 43 groups of chemicals. This process is discussed in detail in Section 2.2.2.

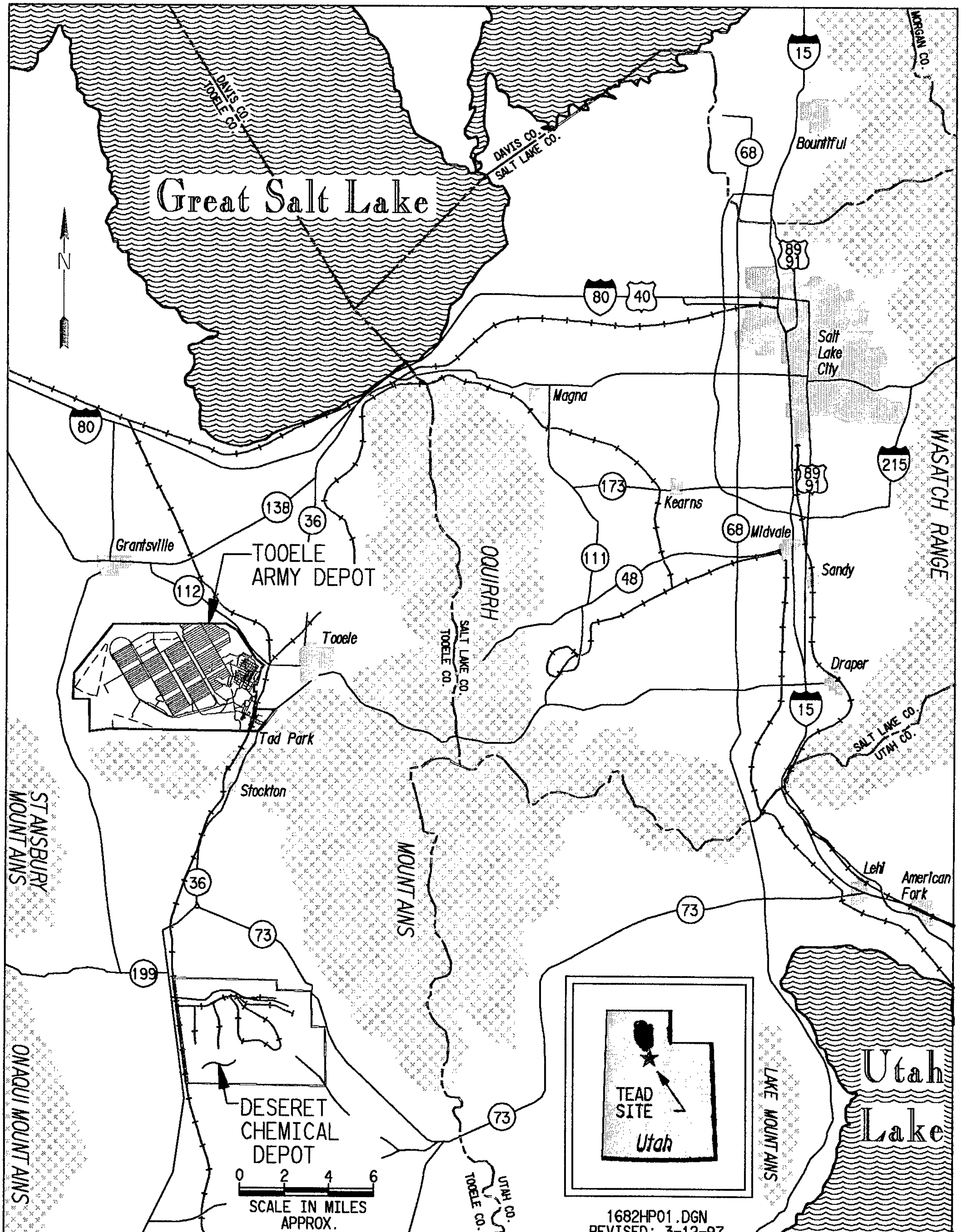

Figure 1-1. Location Map of Tooele Army Depot

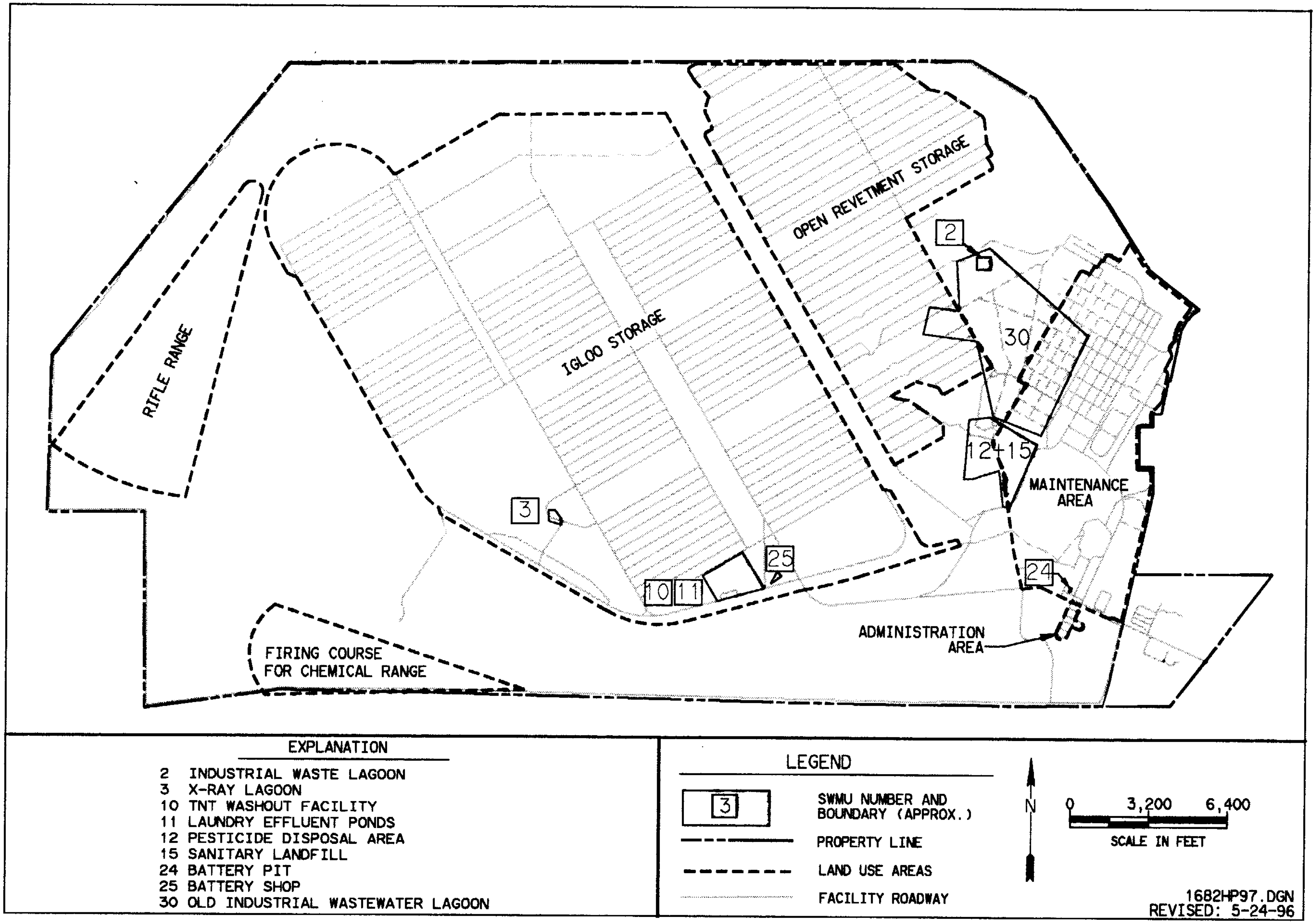

Figure 1-2. Location of Known-Releases SWMUs at TEAD

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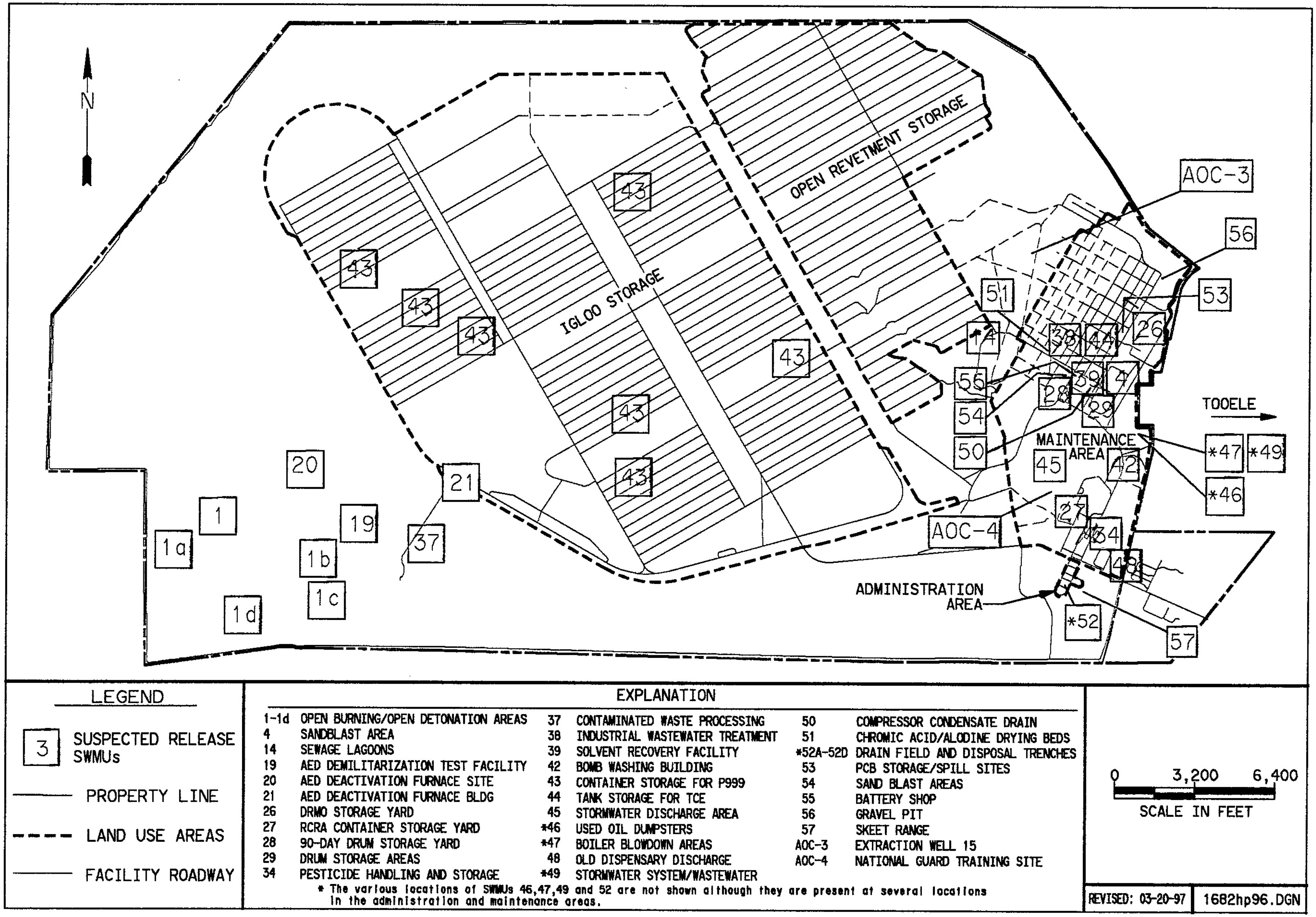

Figure 1-3. Location of Suspected-Releases SWMUs at TEAD

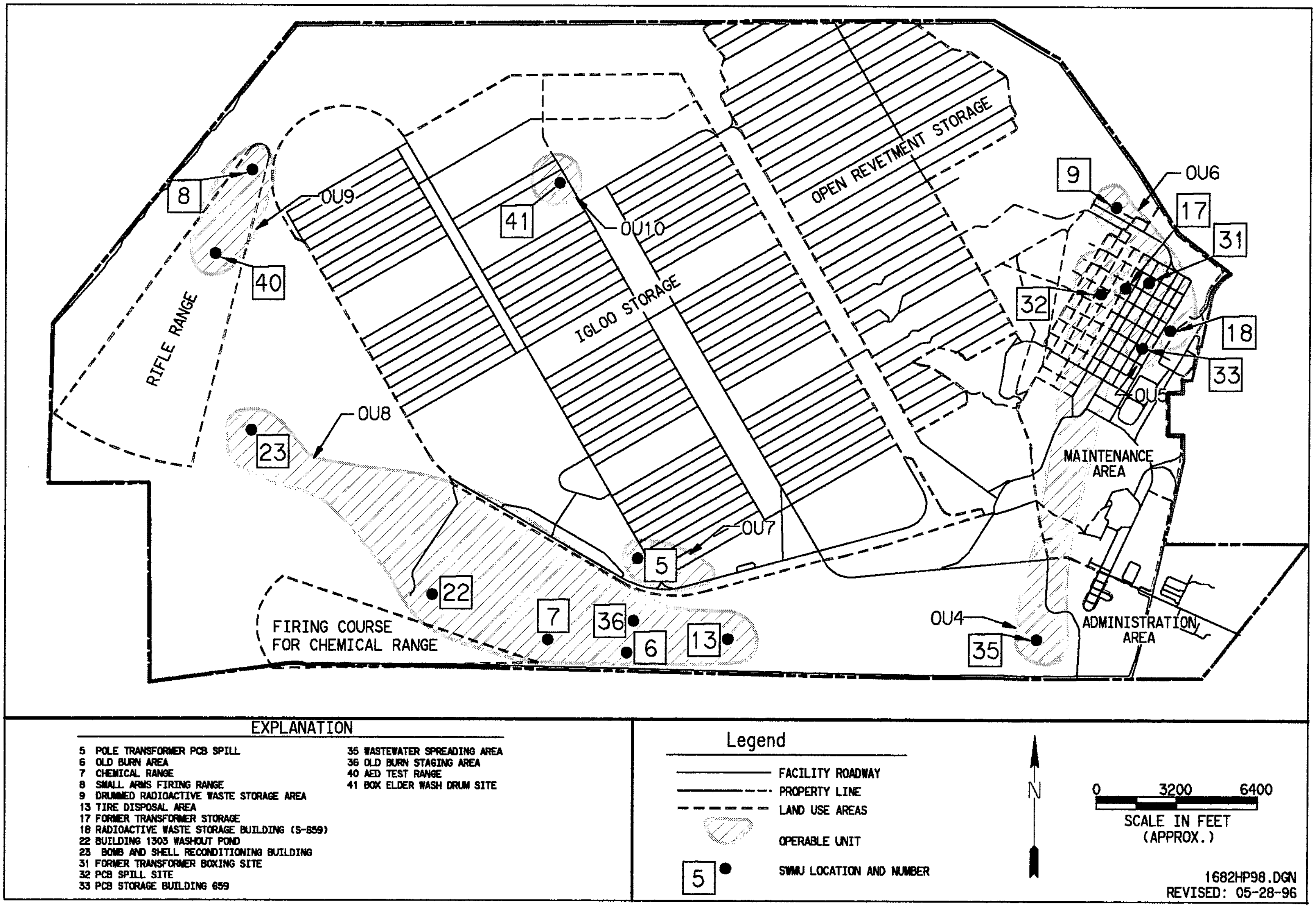

Figure 1-4. Location of 17 RI/FS Operable Units/SWMUs at TEAD

Table 1-1. Summary of Operable Units, Solid Waste Management Units and Areas of Concern at TEAD

SWMU[a] No.	SWMU Name	Description	Chemicals of Potential Concern
Operable Unit 4			
32	PCB[b] Spill Site	Transformer oil spill at Open Storage Lot 665D.	Metals, SVOCs[c]
35	Wastewater Spreading Area	Wastewater released from former residential complex.	Metals, pesticides
31	Former Transformer Boxing Area	Temporary storage of transformers.	PAHs[d]
Operable Unit 5			
17*	Former Transformer Storage Area	Storage of transformers. Vehicle-related equipment storage.	No chemicals of potential concern
33*	PCB Storage Building 659	Storage of PCB-contaminated transformers.	No chemicals of potential concern
Operable Unit 6			
9*	Drummed Radioactive Waste Storage Area	Storage of radioactive waste in 55-gallon drums.	No chemicals of potential concern
18*	Radioactive Waste Storage Building S-659	Storage of low-level radioactive materials.	Radioactive materials
Operable Unit 7			
5*	Pole Transformer PCB Spill	PCB spill from the burning of pole-mounted electrical transformer.	PCB Aroclor 1260, dioxins, furans
Operable Unit 8			
6	Old Burn Area	Testing, burning, and disposal of munitions.	Metals, explosives, SVOCs
7	Chemical Range	Testing of chemical and pyrotechnic-type munitions.	Metals
13	Tire Disposal Area	Stored thousands of tires. Tires were removed, summer 1993.	SVOCs, VOCs[e]
22	Building 1303 Washout Pond	Received washdown water from munitions.	Explosives, metals
23	Bomb and Shell Reconditioning Building	Reconditioning munitions and parts.	Metals, SVOCs, anions
36	Old Burn Staging Area	Stored items for disposal at the Old Burn Area (Site 6).	Metals

Table 1-1. Summary of Operable Units, Solid Waste Management Units and Areas of Concern at TEAD (continued)

SWMU[a] No.	SWMU Name	Description	Chemicals of Potential Concern
Operable Unit 9			
8	Small Arms Firing Range	Used for training in the use of small fire arms.	Metals
40	AED[f] Test Range	Used for the testing of munitions.	Explosives, metals
Operable Unit 10			
41*	Box Elder Wash Drum Site	57 drums disposed of in the Box Elder Wash stream bed.	SVOCs, metals
Known Release SWMUs			
2	Former Industrial Wastewater Lagoon (IWL)	Received industrial wastewater from the maintenance area.	Metals, SVOCs, VOCs
3	Former X-Ray Lagoon	Received wastewater from the Film Processing Building (Bldg. 1223).	Metals, SVOCs
10, 11	TNT Washout Facility Laundry Effluent Ponds	SWMU 10 - Four former TNT Washout Ponds that have been filled and covered. SWMU 11 - Laundry Effluent Ponds received wastewater from buildings. Waste piles identified east of ponds.	Explosives, metals, SVOCs, TPHC[g], VOCs
12, 15	Pesticide Disposal Area Sanitary Landfill	SWMU 12 - Trench where barrels of suspected pesticides were emptied. SWMU 15 - Waste disposed of in Landfill.	VOCs, pesticides, SVOCs, metals, PCBs
24	Battery Pit	Electrolytes from lead-acid batteries discharged to a battery pit.	Metals
25	Battery Shop	Discharge from batteries to ground surface.	Metals
30	Old IWL	Liquid wastes from maintenance operations discharged to a widespread area.	Metals, SVOCs
Suspected Release SWMUs			
1	Main Demolition Area	Open burning and detonation of munitions.	Metals, explosives

Table 1-1. Summary of Operable Units, Solid Waste Management Units and Areas of Concern at TEAD (continued)

SWMU[a] No.	SWMU Name	Description	Chemicals of Potential Concern
Suspected Release SWMUs (cont.)			
1a	OB/OD[h] Area, Cluster Bomb Detonation Area	Former demilitarization of munitions.	Metals, explosives
1b	OB/OD Area, Burn Pad	Former open burning of munitions.	Metals, explosives, dioxins, furans
1c	OB/OD Area, Trash Burn Pits	Former open burning of munitions.	Metals, explosives, VOCs, SVOCs, dioxins
1d	OB/OD Area, Propellant Burn Pans	Open burning of propellants.	Metals, explosives
4	Sandblast Area	Sandblasting for vehicle stripping and painting.	Metals, SVOCs
14	Sewage Lagoons	Receives domestic wastewater from housing, maintenance, and administrative buildings.	Metals, SVOCs
19	AED Demilitarization Test Facility	Demilitarization tests, propagation test, and barricade testing.	Metals, RDX[i], SVOCs, nitrate
20	AED Deactivation Furnace Site	Test demilitarization procedures for munitions.	Metals, explosives
21	Deactivation Furnace Building 1320	Ammunition demilitarization production facility.	Metals, explosives
26	Defense Reutilization and Marketing Office (DRMO) Storage Yard	Coordinates the sale, recycling, and disposal of TEAD surplus materials.	Metals, SVOCs
27	RCRA[j] Container Storage Area	Wastes are stored in building that require treatment before disposal.	No chemicals of potential concern
28	90-Day Drum Storage Area	Previously used for vehicle storage. Now used for drum storage.	Metals, TRPH[k]
29	Drum Storage Areas	Previously used for storage of drums, cylinders, tanker trucks, and lumber. Now used for vehicle storage.	Chromium, lead, cyanide, TRPH, SVOCs, pesticides
34	Pesticide Handling and Storage Area	Storage and mixing/formulation of pesticides and herbicides.	Metals, cyanide, pesticides, herbicides
37	Contaminated Waste Processing Plant	Used for flashing scrap metals and incinerating material.	Metals, dioxins, furans, SVOCs, explosives

Table 1-1. Summary of Operable Units, Solid Waste Management Units and Areas of Concern at TEAD (continued)

SWMU[a] No.	SWMU Name	Description	Chemicals of Potential Concern
Suspected Release SWMUs (cont.)			
38	Industrial Wastewater Treatment Plant (IWTP)	Treats wastewater.	Metals, SVOCs
39	Solvent Recovery Facility	Distills waste solvents.	No chemicals of potential concern
42	Bomb Washout Building	Now serves as a vehicle wash facility. Previously munitions burned in a furnace.	Metals, explosives
43	Container Storage Area for P999	Six storage igloos. Stored chemical munitions components, including rocket parts, fuses, and motor parts.	No chemicals of potential concern
44	Tank Storage of Trichloroethylene	Stored TCE[l] in a 500-gallon storage tank.	No chemicals of potential concern
45	Stormwater Discharge Area	Stormwater from the administrative area discharges to a small pond.	Metals, pesticides, VOCs, SVOCs
46	Used Oil Dumpsters	Used oil from vehicles stored in dumpsters.	TRPH
47	Boiler Blowdown Areas	Buildings containing boiler blowdowns that create steam.	Metals, VOCs, SVOCs, cyanide, TPHC
48	Old Dispensary Discharge (Building 400)	Potential discharge of X-ray developing chemicals.	Metals, PAHs, pesticides
49	Stormwater System/Industrial Wastewater Piping Systems	Stormwater and industrial sewer discharge from 600 to 1000 series buildings.	VOCs, SVOCs, metals
50	Compressor Condensate Drain (Building 619)	Potential discharge of lubricating oils into compressor condensate drain.	VOCs and SVOCs
51	Chromic Acid/Alodine Drying Beds (Building 623)	Four concrete pads used to dry chromic acid and alodine wastes from maintenance area.	VOCs, SVOCs, metals
52	Drain Field and Disposal Trenches	Administrative Area. Drain field and trenches, plus area with black material on ground, and horse stable area.	VOCs, SVOCs, pesticides
52A	Possible Drain Field	Administrative area. May have been sewage drain field.	No potential contaminants of concern.
52B	Disposal Trenches	Administrative area. May have been used as waste disposal area	No potential contaminants of concern.

Table 1-1. Summary of Operable Units, Solid Waste Management Units and Areas of Concern at TEAD (continued)

SWMU[a] No.	SWMU Name	Description	Chemicals of Potential Concern
Suspected Release SWMUs (cont.)			
52C	Area Containing Charcoal Material	Administrative Area. Charcoal material found on ground surface between Skeet Range and installation boundary.	VOCs, SVOCs
52D	Horse Stable Area	Administrative Area. Drainage routes from pasture and stables.	Pesticides
53	PCB Storage/Spill Sites (Buildings 659, 679)	Exterior locations adjacent to TSCA[m] permitted facility.	PCBs
54	Sandblast Areas (Buildings 603, 604, 611, 612, 613, 637, 647)	Used sandblast material collected in steel drums for disposal.	SVOCs, metals
55	Battery Shop (Building 618)	Old Battery Shop currently used as a cafeteria.	Metals
56	Gravel Pit (Adjacent to Building 699)	Gravel pit with burned and bermed areas	Metals, SVOCs, pesticides
57	Skeet Range	Skeet range next to SWMU 52 drain field	Metals, SVOCs
AOC3[n]	Extraction Well 15E	Possible water disposal area	VOCs
AOC4	Unknown site near Ammo Storage Area	Small fenced area	Metals

*Record of Decision (ROD) signed.
[a]Solid Waste Management Unit.
[b]Polychlorinated biphenyls.
[c]Semi-volatile organic compounds.
[d]Polynuclear aromatic hydrocarbons.
[e]Volatile organic compounds.
[f]Ammunition Equipment Directorate.
[g]Total petroleum hydrocarbons.
[h]Open Burn/Open Detonation.
[i]Cyclonite.
[j]Resource Conservation and Recovery Act.
[k]Total recoverable petroleum hydrocarbons.
[l]Trichloroethylene.
[m]Toxic Substances Control Act.
[n]Area of Concern.

1.2 INFORMATION SOURCES AND REGULATORY GUIDANCE

Guidance for the selection and definition of field methods and sampling procedures for this SWERA was acquired from the *Compendium of Superfund Field Operations Methods* (USEPA 1987a), which is a compilation of demonstrated field techniques that have been used during remedial response activities at hazardous waste sites. The SWEAP/QAPjP was prepared according to USEPA guidance for *Developing Work Scope for Ecological Assessments* (USEPA 1992a) and incorporated pertinent elements from the USEPA's *Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual* (USEPA 1989a).

Ecological studies, surveys, and sampling were conducted according to accepted professional standards. Additional methods that were followed to detect injury to biological resources are provided in the *Type B Technical Information Document: Injury to Fish and Wildlife Species* (U.S. Department of the Interior 1987). The required federal and state permits were obtained prior to any destructive sampling or collecting. In addition, current listings of threatened, endangered, and sensitive species of wildlife and plants were addressed through contact with the Utah State Supervisor of the USFWS in Salt Lake City.

The following federal applicable or relevant and appropriate requirements (ARARs) are directly related to investigating the various ecological components at TEAD: *Fish and Wildlife Coordination Act* (16 USC 661-666), *Endangered Species Act* (16 USC 1531, 50 CFR Parts 200 and 402), *Migratory Bird Treaty* (16 USC 703), *Protection of Bald and Golden Eagles* (16 USC 668-668d), *Protection of Migrating Game and Insectivorous Birds* (16 USC 701-718h), and *Endangered and Threatened Wildlife and Plants* (50 CFR 17.11 and 17.12). Table 1-3 in the *Final Remedial Investigation Report for Operable Units 4-10* (Rust E&I 1994a) provides a comprehensive listing of primary ARARs for TEAD.

1.3 SITE LOCATION

TEAD covers approximately 24,732 acres situated in the Tooele Valley, Tooele County, Utah, as shown in Figure 1-1. South Mountain and the Stockton Bar are located south of TEAD; Stansbury Mountains are to the west; Oquirrh Mountains are to the east; and the Great Salt Lake is to the north. Salt Lake City is approximately 35 miles northeast of TEAD. Small towns in the vicinity of TEAD are Grantsville, located 2 miles north of the depot, and Tooele, which is immediately east of the depot.

Properties to the north of TEAD are used primarily for pasture and cultivation, and to the west and south, for rangeland grazing. The southeastern portion of TEAD is bounded by State Highway 36. On the eastern side of TEAD, there is a right-of-way for the Union Pacific Railroad. Tooele Municipal Airport and scattered residential homes are located east of this railroad right-of-way. The facility is bounded on the north by State Highway 112. North of Highway 112 are the Tooele County Landfill, a construction company, and undeveloped land.

1.4 SITE HISTORY AND BACKGROUND INFORMATION

Established on April 7, 1942, by the U.S. Army Ordnance Department, TEAD, originally called Tooele Ordnance Depot, was used as a backup depot for the Benicia Arsenal and the Stockton Ordnance Depot, both located in California. Eventually, the depot took on the responsibilities of the Ogden Arsenal of Ogden, Utah. The depot was used to store vehicles, small arms, and other equipment for export.

In 1962, the depot was redesignated as Tooele Army Depot. Tooele Army Depot (originally consisting of both TEAD-North and TEAD-South) became one of the major ammunition storage and equipment maintenance installations in the U.S. and supported other Army installations throughout the western United States. The major missions of TEAD have included the maintenance, renovation, and storage of wheeled vehicles, and the reception, storage, issuance, maintenance, and disposal of munitions. Major functions have included the following:

- Supply, distribution, and storage of general supplies and ammunition
- Storage of strategic and critical materials
- Maintenance of ammunition and general supplies for TEAD
- Demilitarization of ammunition
- Supervision and training of assigned units
- Logistical support and training assistance to U.S. Army Reserves
- Design, manufacture, procurement, storage, and testing of ammunition equipment
- Repair, maintenance, and storage of military vehicles and other equipment

In 1993, TEAD was placed on the list of facilities scheduled for realignment and closure by the Base Realignment and Closure Commission. Vehicle and equipment maintenance and storage functions were to be transferred, whereas ammunition storage would continue. Under the terms of the Base Realignment and Closure Act of 1990 and the Community Environmental Response Facilitation Act (CERFA), the Army is investigating the feasibility of expediting the turnover of the maintenance area to the public following the transfer of the maintenance mission to the Red River Army Depot in Texas.

As a result of continuous operations at TEAD since 1942, known waste, potential waste, and spill sites have been identified. In 1987, under contract to the USEPA, a *Final Interim RCRA Facility Assessment for TEAD* (NUS 1987), which identified 28 SWMUs, was completed. These SWMUs were suspected or known to have released contaminants into the environment. Subsequent investigations identified an additional 30 SWMUs or Areas of Concern, which resulted in a total of 58 potential hazardous waste sites at TEAD. As contractor to the USAEC, Rust E&I is responsible for completing the Final RI and an RI addendum on 17 SWMUs within OUs 4-10, and for completing the RCRA Facility Investigation (RFI) for the known releases SWMUs. Montgomery-Watson has been contracted to address the RFI concerning Group A suspected releases SWMUs. SAIC, Inc. has responsibility for the preparation of the RFI for the Groups B and C suspected releases SWMUs.

As a part of the operation and maintenance of this facility and prior to the institution of regulations governing such actions, the release and disposal of hazardous materials were not well regulated or documented. The main operations that have released potential contaminants to the environment in the past include industrial activities, disposal and storage operations, surveillance testing of munitions, and demolition and burning of munitions. These operations are discussed in the following subsections, along with brief descriptions of the SWMUs located within these areas of operation. Additional information about the individual SWMUs can be found in the following documents: (1) *Final RI Report for OUs 4-10* (Rust E&I 1994a); (2) *Revised Final RI Addendum Report for OUs 4, 8, and 9* (Rust E&I 1997); (3) *Revised Final Phase II RFI Report for Known Releases SWMUs* (Rust E&I 1995a); (4) *Final Phase II RFI Report for Group B Suspected Releases SWMUs* (SAIC 1996a); (5) *Final Phase I RFI Report* (Montgomery-Watson 1993); (6) *Revised Final RFI Report for Group A Suspected Releases SWMUs* (Montgomery-Watson 1996); and (7) *Draft Final RFI Report for BRAC Parcel Group C SWMUs and AOCs* (SAIC 1996b).

1.4.1 Industrial Activities

Industrial activities at TEAD have included the maintenance, renovation, and storage of ammunition and combat vehicles. Wastes generated have included metals, detergents, grease, oil, acids, and caustics in wastewater; metals and organic compounds from sandblasting operations; PCBs from electrical equipment storage and maintenance; and inorganic and organic materials from general equipment maintenance. SWMUs associated with these activities are briefly described in the following subsections. More detailed information is available in the reports referenced in each subsection.

1.4.1.1 *SWMU 4—Sandblast Area*

Three sandblast areas, present in the maintenance area of TEAD, were associated with vehicle stripping and painting. They are located in Buildings 615, 617, and 600, where sandblasting media were reused until they lost their effectiveness. The spent media had the consistency of a fine dust and were collected for temporary storage in dumpsters prior to removal by a hazardous waste contractor for off-site disposal. The three types of sandblasting media used at TEAD were steel grit, ground walnut shells, and glass beads. In addition, stripping wastes, paint booth wastes, and spent solvents from degreasing operations were drummed and removed for off-site disposal. COPCs at this SWMU include metals and semi-volatile organic compounds (SVOCs) (SAIC 1996a).

1.4.1.2 *SWMU 5—Pole Transformer PCB Spill*

In 1976, a fire occurred in a pole-mounted electrical transformer. As a result, the transformer, located on pole No. 184, leaked PCB-containing oil to the surrounding soils. The

oil-saturated soils were excavated adjacent to the pole. The excavation measured approximately 5 feet by 5 feet and 3 feet deep at the center. Eleven 55-gallon drums of soil were collected during the cleanup. The drums were stored near the utility pole, but were later moved to the PCB Storage Building 659 (SWMU 33). A composite sample was collected from the 11 drums and analyzed for PCBs, and the drums were properly disposed of off-site. The excavation was not backfilled. COPCs at this SWMU include PCBs and dioxins/furans. The record of decision (ROD) for OU 7, which consists of SWMU 5, was signed in September 1994 and selected a cover as the remedial alternative to be implemented (Rust E&I 1994a). Remedial design and fieldwork have been completed.

1.4.1.3 *SWMU 10—TNT Washout Facility*

The TNT Washout Facility consists of the bomb reconditioning building (Building 1245), a former storage facility (Building 1246), the old TNT washout ponds, and the new TNT washout pond. Construction of the facility was completed in 1948. The facility remained active until 1986, with periods of heavy use occurring from 1948 to 1958 and from 1960 to 1965. After 1965, the facility was not in frequent operation and was only active for approximately 6 months from 1966 through 1984. Various munitions (i.e., projectiles, bombs, and rocket heads) filled with 2,4,6-trinitrotoluene (TNT), Composition B (a mixture of TNT and RDX), RDX, and tritonal (2-methyl-1,3,5-trinitrobenzene with aluminum) were brought to Building 1245 to be decommissioned. The casings were cut open in order to remove the explosive material. Explosives removal was accomplished by heating the warhead in an autoclave using steam. Casings were rinsed with water to remove any residual explosive material. Any recovered explosive was contained and then either sold or destroyed in the demolition area. The spent casings were melted down, and the metal was recycled. Prior to discharge to the outdoor settling tanks, the rinse water obtained from the washout process was filtered in order to capture explosive material contained in the rinse water. This filtering system used horse hairs as the filtering material. Spent filters were transported to the ordnance burner and destroyed. During 1983, a charcoal-filtering system was installed in Building 1245 to replace the old horse-hair system. After filtering, all rinse water was routed outside the building to the north through a metal trough, which emptied into a cement settling tank. This baffled tank continuously received rinse water from the facility for an average of 8 hours a day at an average rate of 20 gallons per minute.

In 1965, a 35,000-gallon indoor settling pond was installed in Building 1245 in order to recycle the rinse water and improve the recovery of the explosive material remaining in the water. After leaving the settling tank, the rinse water flowed into a series of unlined and bermed evaporation/percolation settling ponds. These ponds, known as the Old TNT Washout Ponds (a series of four ponds, connected to one another by overflow pipes), were located directly north of the decommissioning facility. As an interim measure, the washout ponds were closed in the fall of 1984. TEAD pushed the containment berms surrounding each pond toward the center in order to fill the depressions. A PVC liner was placed over the area of the ponds and covered with clean soil. In conjunction with the installation of the charcoal-filtering system, a fifth washout pond was constructed northwest of Building 1245. This new bermed

and unlined washout pond was constructed to measure 8 feet deep, 116 feet wide, and 125 feet long. This basin received backwash water from the charcoal-filtration system during facility clean-out operations; the filtered washdown rinse water was contained in the 35,000-gallon settling tank inside the facility. Backwash rinse water was transported to the new washout pond through a 6-inch PVC pipe that exited the outdoor settling tank. In addition to the backwash rinse water, overflow from the 35,000-gallon tank was also periodically discharged to the pond. COPCs for this SWMU include explosives, metals, SVOCs, and VOCs (Rust E&I 1995a).

1.4.1.4 *SWMU 11—Laundry Effluent Pond*

The Laundry Effluent Pond, SWMU 11, is located north of the TNT Washout Building and includes a septic tank and leach field, the sewage pond, laundry effluent pond, sand pit, and waste piles. The sewage pond was originally constructed to receive laundry effluent and lies directly south of the laundry effluent pond. A septic tank and leach field are located south of the sewage pond, and it is suspected that several buildings may be connected to the septic tank and leach field. The first pond north of the septic tank was constructed to receive laundry effluent discharge; however, because of gradient problems, the pond was never used. Seepage of liquids into the bottom of the pond has been observed over the years. This seepage is believed to be from septic tank discharge. Immediately north of the sewage pond is the laundry effluent pond, which accepted discharge liquids from the laundry and showers located in Building 1237 until 1990. It also received boiler blowdown water from Building 1237. The effluent was originally discharged by underground pipe to ditches that flowed to small ponds. The overflow from these ponds continued north in a drainage area. In the 1970s to early 1980s, the drainage was diverted to the northwest in addition to the original northerly direction. Sometime in the early 1980s, the pond receiving laundry effluent was expanded. This bermed, unlined pond, which is approximately 16 feet deep, 80 feet wide, and 100 feet long, received an estimated 7,200 gallons of effluent per day during periods of high use. For a 2-year period, the laundry effluent was discharged to pond 3 of the Old TNT Washout Facility (SWMU 10) because of piping problems. The piping was replaced in 1984, and the effluent discharge was continued until 1990. Boiler blowdown water from Building 1237 is still discharged to the Laundry Effluent Pond during the winter months.

An area containing several piles of surface debris, including potentially hazardous waste, was identified east of the Laundry Effluent Ponds and added to this SWMU. The debris consists of metal cuttings, oil filters, brake drums, and other miscellaneous debris. COPCs for this SWMU include explosives, metals, SVOCs, total petroleum hydrocarbons, and VOCs (Rust E&I 1995a).

1.4.1.5 *SWMU 22—Building 1303 Washout Pond*

The Building 1303 Washout Pond is located in the southwestern portion of TEAD. This SWMU consists of a shallow depression that reportedly received washdown water from Building 1303. Building 1303 was a facility for sawing apart high explosive bombs and projectiles. The washdown water contained explosives as the water left the building. The washdown water ran from the building doors, across a shallow depression in the concrete pad into an unlined ditch, and to a shallow depression referred to as the Building 1303 Washout Pond. Most of the liquids from the washdown operation would have infiltrated into the ground before the depression filled; however, it is possible that the depression may have filled and overflowed, resulting in the spreading of potentially contaminated water to surface soils. Elevated metals concentrations were detected in surface soil throughout this SWMU. Explosives were detected in the discharge ditch and ponding area. The COPCs at this SWMU are heavy metals and explosive compounds (Rust E&I 1997).

1.4.1.6 *SWMU 23—Bomb and Shell Reconditioning Building*

The Bomb and Shell Reconditioning Building is located in the western portion of TEAD and consists of Buildings 1343, 1344, and 1345. From the late 1950s to 1977, the main building (Building 1345) was used to conduct reconditioning of large munitions, including sandblasting and painting. Floor drains in Building 1345, located near the paint booths, discharged liquids from washdown operations to a ditch northeast of the building. Another discharge pipe and ditch are located southeast of Building 1344, south of the paved drive. The source of the liquid still discharged into this ditch is suspected to be boiler blowdown water from Building 1343. The ditches both parallel the road and then cross beneath the road via culverts to areas where the liquids are discharged to surface soils. Building 1343 houses a boiler that was used for hot-water or steam washing during the bomb and shell reconditioning process. Located behind Building 1343 is an underground storage tank (UST) containing diesel used for the boiler. Although bomb and shell reconditioning activities are no longer conducted at this site, Building 1345 is still used occasionally as a paint shop. RI investigations determined the presence of cyanide, metals, SVOCs, and PCBs in soil samples collected at this SWMU. These contaminants were scattered throughout the surface soil at this SWMU. However, elevated concentrations were localized in the outfall discharge areas and areas exhibiting staining of the surface soil (Rust E&I 1997).

1.4.1.7 *SWMU 25—Battery Shop*

The Battery Shop was located in Building 1252. The shop was used for maintenance and repair of vehicle and forklift batteries from 1980 to March 1993 when it was moved to Building 620. From 1980 to 1990, the waste stream generated by the facility was discharged to a ditch and onto the ground surface northeast of the building. The discharge consisted of spent battery acid and washdown water. Beginning in 1982, the battery acid and washdown

water were neutralized with sodium bicarbonate or sodium hydroxide. The shop floor was washed down daily using sodium bicarbonate mixed with drinking water and discharged to the ditch. Rags and mops used in this cleanup activity were disposed of in the sanitary landfill along with the accumulated sludge. Acid began being barreled for disposal in 1986. Washdown water from the floors ceased being discharged to the ditch in 1990. The drain was sealed, and the sump leading to the drain pipe was used for collection of washdown wastes. After that time, all waste and wastewater were removed from the sump, containerized, and disposed of at the Industrial Waste Treatment Plant. Old and damaged batteries and the drummed acid waste were transported off the TEAD site for recycling and/or disposal. The facility was moved from Building 1252 to Building 620 in March of 1993. Heavy metals are the primary COPCs at this SWMU (Rust E&I 1995a).

1.4.1.8 *SWMU 31—Former Transformer Boxing Area*

The Former Transformer Boxing Area is located on Open Storage Lot 680. Lot 680 is a flat, gravel-covered area measuring 625 feet by 300 feet. This area is located approximately 1,600 feet east of the PCB Spill Site (SWMU 32). Lot 680 was used from 1979 to 1980 for the temporary storage of transformers that were once stored at the Former Transformer Storage Area (SWMU 17). No leaks or spills were reported to have occurred during the short-term storage of the transformers at SWMU 31. From Lot 680, the transformers were sent for off-site disposal or were transferred to Building 659 (SWMU 33). More recently, this SWMU has been used for vehicle storage. The Phase II RI investigation detected SVOCs at scattered locations on the surface soil at this SWMU, which likely resulted from the vehicle storage operations. PAHs are the primary COPCs at this SWMU (Rust E&I 1997).

1.4.1.9 *SWMU 32—PCB Spill Site*

The PCB Spill Site is located in the southern corner of Open Storage Lot 665D. In October of 1980, a transformer oil spill occurred at the southwestern corner of the lot. Two transformers, reportedly containing a total of 1,000 gallons of PCB-contaminated oil, were punctured with a fork-lift blade during transformer removal operations. The spill occurred on the unpaved ground surface, and the spill area was reportedly less than one-half acre. Cleanup involved excavating oil-saturated soils, containerizing the soils in 55-gallon drums, and properly disposing these drums. Approximately 440 55-gallon drums of contaminated soil and 18 drums of contaminated oil were removed. The excavation area was backfilled with imported fill material. Lot 665D is currently used for vehicle-related equipment storage. PCBs were expected to be the primary COPCs at this SWMU. However, no PCBs were detected in the RI investigation. The presence of SVOCs in surface soil is most likely the result of vehicle storage operations at this SWMU (Rust E&I 1997).

1.4.1.10 *SWMU 35—Wastewater Spreading Area*

The Wastewater Spreading Area is located approximately 1,500 feet south of the Administration Area and 4,000 feet west-southwest of a former residential complex in the southeastern portion of TEAD. Wastewater was reportedly discharged from the former residential complex where it subsequently flowed westward through two culverts under railroad tracks into two unlined ditches, each approximately 4 to 6 feet deep. After crossing under the railroad tracks, the ditches crossed a grassy field until they discharged into a ravine. The ravine drops 40 to 50 vertical feet and continues to the west where it discharges into a relatively flat spreading area covered with vegetation, including elm and Russian olive trees, shrubs, and grasses. Currently, only concrete foundations remain in the former housing area, and the SWMU is fenced and used as part of the TEAD horse stable complex. Horse grazing occurs on the Wastewater Spreading Area. Pesticides and heavy metals are the primary COPCs at this SWMU. Most of the pesticides were concentrated in the surface drainage ditches above the spreading area, while elevated metals concentrations were detected within the spreading area (Rust E&I 1997).

1.4.1.11 *SWMU 37—Contaminated Waste Processing Plant*

The Contaminated Waste Processing Plant (CWP) is an incinerator located in the southwestern portion of TEAD, southwest of the ordnance area. The CWP consists of one large building (Building 1325), another smaller storage building, and adjacent staging and storage areas. The furnace is fired by diesel oil from a UST located south of the building. Since its installation in approximately 1980, the CWP has been used primarily for flashing scrap metal and incinerating PCP-treated wooden crates, general packaging materials (dunnage), scrap resins, and fabric contaminated with explosives. This furnace differs from the furnaces at the AED Deactivation Furnace Site (SWMU 20) and the Deactivation Furnace Building 1320 (SWMU 21) in that it is a batch-type basket furnace rather than a rotary kiln. In addition, the CWP is not used for deactivating munitions. Air pollution control equipment, installed during construction of the furnace, consists of a cyclone, gas cooler, and baghouse. When operating, all metal debris is certified as clean and sent to the Defense Reutilization and Marketing Office (DRMO) Storage Yard (SWMU 26) for salvage. Incinerator ash, cyclone dust, and baghouse dust are drummed as hazardous waste and sent to the 90-day Drum Storage Area (SWMU 28) pending analysis and disposal. COPCs at this SWMU include metals, explosives, dioxins, furans, and SVOCs (Montgomery-Watson 1996).

1.4.1.12 *SWMU 38—Industrial Wastewater Treatment Plant*

Operation of the Industrial Wastewater Treatment Plant (IWTP) began in November 1988. This facility handles an average of about 116,000 gallons of wastewater per day (gpd). Of this total, an average of 103,000 gpd of wastewater is recycled, and the remaining wastewater is discharged to the Tooele publicly owned treatment works. Treatment at the IWTP includes air

strippers for VOCs, a flocculator and clarifier for settling out metals, sand filters for filtering solids, and granular activated carbon (GAC) to remove VOCs and SVOCs. During about a 1-year period when the facility first opened, shipping containers in which spent GAC was stored were left uncovered, and it was blown onto nearby surface soils along the west side of the facility. COPCs at this SWMU include metals and SVOCs (SAIC 1996a).

1.4.1.13 *SWMU 39—Solvent Recovery Facility*

The solvent recovery facility (Building 600c) is located on the west side of the maintenance area of TEAD. The facility was built in October 1988 and annually distills approximately 10,500 gallons of waste solvents. Approximately 7,100 gallons of solvents are recovered while 2,100 to 2,250 gallons of waste are disposed of. Solvents that are currently recycled include 1,1,1-trichloroethane, Stoddard solvent, polyurethane thinner, and lacquer thinner. The facility contains pumps, a distillation unit, a condenser, and associated equipment for pumping waste solvents from drums and separating solvent from sludge (still bottoms). The building has explosion protection and is bermed on the inside to contain spills. The floor is equipped with drains that would direct spills to the IWTP. Solvents treated at this facility are first taken to the 90-Day Drum Storage Area (SWMU 28) for inspection to determine if they are suitable for recycling. Drums containing recyclable solvents are transported to the Solvent Recovery Facility for treatment. Recyclable solvents are passed through a filter system and a distillation unit. The still bottoms are drummed and temporarily stored in a fenced satellite area, which is a bermed concrete pad outside the building. The stored still bottoms are collected and disposed of by a hazardous waste contractor. There have been no spills of reportable quantities at this facility. There are no COPCs at this SWMU (Montgomery-Watson 1993).

1.4.1.14 *SWMU 42—Bomb Washout Building*

The Bomb Washout Building (Building 539) is located in the southeastern portion of TEAD, between the Maintenance Area and the Administration Area. Building 539 has recently been renovated and now serves as a vehicle wash facility. Between the early 1940s and early 1960s, projectiles from small arms munitions (30 and 50 caliber) were burned in a retort furnace located in this building. Molten lead was reclaimed during the process from beneath the furnace. During the operation, waste from the incineration and lead reclamation process consisted of smoke and ash from the furnace and spilled molten lead. When the building was cleaned, wash water discharged via a steel-lined concrete flume that extended from the northeast corner of the building. The flume ran east-west about 10 feet north of the building and discharged into an open ditch. The ditch is still present and extends approximately 600 feet west into an unlined holding pond, which is also still present. During operation, the furnace generated significant amounts of smoke. Because no air emission control devices were installed on the smoke stack, heavy particulates from the smoke settled out onto a "drop-out box" located on the roof of the building. This process also released contaminants to the air

during the operation of this furnace. The furnace was dismantled around 1960, and the building was used for storage until recently. The area around the building is paved, although the pavement is broken in places. There was a second furnace located approximately 225 feet north of Building 539. This furnace, not enclosed inside a building nor covered, was used to incinerate fuses and other small munitions. It was reportedly about the same size as the furnace in Building 539 and operated during the same time period (early 1940s to early 1960s). COPCs at this SWMU include metals and explosives (Montgomery-Watson 1996).

1.4.1.15 *SWMU 45—Stormwater Discharge Area*

The Stormwater Discharge Area is a small unlined stormwater collection area located midway between the Maintenance and Administration Areas immediately north of a set of railroad tracks. Stormwater from the Administration Area drains via an underground concrete piping system to a depression in a wash, where it discharges to form a small ephemeral pond estimated to be 0.1 acre in size. Sufficient stormwater is collected to allow the establishment of cattails and deciduous trees in the drainage area. COPCs for this SWMU include metals, pesticides, VOCs, and SVOCs (Montgomery-Watson 1996).

1.4.1.16 *SWMU 47—Boiler Blowdown Areas*

This SWMU consists of four locations in the Maintenance Area and includes buildings 600, 610, 637, and 691. Each of these buildings contains a boiler that generates steam. During boiler plant maintenance, the boiler is back-flushed, which produces small concentrations of blowdown water. Tannic acid, an organic compound, is used to reduce scale buildup inside the boiler during this process and gives the blowdown water a reddish color. At three of the four locations, the boiler blowdown water is discharged from the boiler buildings to a sewer system. At Building 691, however, effluent from multiple sources including the building boiler, paint booth areas, and interior and exterior drains is discharged through a culvert to a point approximately 1,000 to 1,200 feet west of the building. From here, it flows along a small open ditch westward and most likely infiltrates into the surface soil. COPCs for this SWMU include metals, VOCs, and total petroleum hydrocarbons (SAIC 1996a).

1.4.1.17 *SWMU 48—Old Dispensary Discharge (Building 400)*

SWMU 48 contains an area where the TEAD dispensary building (previously Building 400) formerly stood. This location is approximately 300 feet northwest of the present TEAD clinic. Building 400 was constructed in 1945 as the hospital facilities administration building and later became the hospital. Along with several other buildings, it was razed in the mid-1980s. Regulatory concerns regarding disposal facilities and practices, in particular the X-ray development operations, prompted the designation of the area where the building previously stood as a SWMU. Even though available plans show the X-ray operations waste streams

emptied into the sanitary sewer system, the possibility exists that they may have been emptied into the stormwater sewer lines. The former dispensary site is currently a flat, grass-covered area, with only an asphalt parking lot and manholes to access the sewer and water lines that once served the building. COPCs for this SWMU include metals, PAHs, and pesticides (Montgomery-Watson 1996).

1.4.1.18 *SWMU 49—Stormwater System/Industrial Wastewater Piping Systems*

SWMU 49 is comprised of the current stormwater sewer system (formerly, the industrial wastewater pipelines), the old connections to the new industrial wastewater system, and the Steam Cleaning/Radiator Repair Facility at Building 609. This SWMU contains manholes, pipes, drain systems, and culverts, which serve as a stormwater drainage system for the entire maintenance area. The discharged water drains onto the surface north of the maintenance area and dissipates through evaporation and infiltration. Prior to the construction of separate drainage systems for the stormwater and the industrial waste, both the stormwater and the industrial effluent flowed through the same pipelines and were discharged to the location mentioned above. As many as 120,000 gallons of potentially contaminated water flowed through this system daily. The contaminants likely included acids, caustics, solvents, detergents, oils and grease, and heavy metals. These chemicals were used in industrial operations such as vapor degreasing, metal cleaning, stripping, anodizing, electroplating, spray painting, and sandblasting, all of which were performed in the maintenance area. In the late 1980s, industrial wastewater was rerouted to the Industrial Wastewater Treatment Plant. Currently, only surface water runoff (stormwater) flows through the old piping system. COPCs from previous operations include VOCs, SVOCs, and metals (SAIC 1996b).

1.4.1.19 *SWMU 50—Compressor Condensate Drain (Building 619)*

This SWMU originally consisted of a series of buildings containing compressor condensate drains. However, only one (Building 619) has a drain that could be located. The compressor condensate drain at Building 619 originates at a single surface level perforated floor drain. The drain pipe leads to a partially buried 55-gallon steel drum, the bottom of which is perforated and all of which is buried in a gravel sump. There are no known contaminant releases at this SWMU; however, it is suspected that lubricating oils from the compressor along with compressor effluent have leaked into the drain system. COPCs for this SWMU include VOCs and SVOCs (SAIC 1996b).

1.4.1.20 *SWMU 51—Chromic Acid/Alodine Drying Beds (Building 623)*

This SWMU consists of four concrete slabs (marked as Facility 623) located southeast of the consolidated Maintenance Facility. Two of the pads have a small trench down the center in order to drain liquid off the surface of the slab. These were possibly used to drain the coolant from engines and radiators. Records indicate that the pads were used as drying beds for the

disposal of chromic acid and alodine wastes from the Maintenance and Supply Area in the 1970s. It may have also been used for testing rebuilt pumps. There are no known releases at this SWMU. However, potential releases of VOCs, SVOCs, and metals may have occurred (SAIC 1996b).

1.4.1.21 *SWMU 54—Sandblast Areas (Buildings 604, 611, and 637)*

This SWMU consists of three separate areas with the main sandblasting areas found in buildings 604, 611, and 637. All of these building are located within the maintenance area at TEAD. Three types of material are used for sandblasting: steel grit, ground walnut shells, and glass beads. The used material is collected in sealed dumpsters outside of these buildings and removed by a hazardous waste contractor to an off-site disposal facility. Building 604 has a small dust collection unit located along the northeast side of the building. Contaminated soil has been found next to Building 611. Building 637 contained a large sandblasting operation with spent media-collection hoppers located outside the building. The used sandblasting materials (excluding the glass beads) have been analyzed and were found to contain barium, cadmium, chromium, lead, nickel, and SVOCs (SAIC 1996b).

1.4.1.22 *SWMU 55—Battery Shop (Building 618)*

SWMU 55 is located in maintenance area Building 618. This building is currently used as a cafeteria. Records confirm that the building was previously used as a battery shop with battery maintenance and repair activities located throughout the entire building. Potential disposal activities or spills may have resulted in contaminant releases. The most likely COPCs are metals (SAIC 1996b).

1.4.1.23 *SWMU 56-Gravel Pit*

This SWMU is located east of Building 699 along the northeast perimeter of the Depot and consists of a low-lying area surrounded on three sides by a ridge or berm. An area in the southern berm has a burned appearance. COPCs for this SWMU are metals, pesticides, and SVOCs (SAIC 1996b).

1.4.1.24 *SWMU 57-Skeet Range*

This SWMU consists of a skeet range located near the main entrance to TEAD. Although regulations have prohibited the use of lead shot since the commencement of skeet and trap activities, lead shot may have been inadvertently used. Furthermore, because PAHs are used in the manufacture of clay targets, PAHs may have been released into the range soil. COPCs at this location are SVOCs and metals (SAIC 1996b).

1.4.2 Disposal and Storage Operations

Disposal and storage operations at TEAD include the sewage lagoons, the sanitary landfill, holding ponds, and drum storage facilities. A brief description of each of these SWMUs is provided in the following subsections. More detailed information is available in the reports referenced in each subsection.

1.4.2.1 *SWMU 2—Former Industrial Wastewater Lagoon (IWL)*

The IWL was located in the eastern portion of TEAD and consisted of an unlined evaporation pond approximately 200 feet by 400 feet. The pond received wastewater from various Maintenance Area industrial operations between 1965 and 1988 via four unlined ditches. The main ditch extends approximately 1.5 miles from the outfalls near the Maintenance Area to the lagoon. Wastewater originated from metal cleaning and stripping; sandblasting; steam cleaning; boiler plant waters; dynamometer test cells; and overflow, spillage, and leaks of effluent containing solvents, paint, photographic chemicals, and oils. Through infiltration, contaminants from the wastewater reached the groundwater pathway. The lagoon and ditches were closed by removing contaminated soils from the ditches, placing these soils on the lagoon, and covering the lagoon with a synthetic liner and a clean soil cover. A groundwater pumping and treatment system was installed and is currently treating the contaminant plume at a rate of 5,000 gallons per minute. COPCs for this SWMU include metals, SVOCs, and VOCS (Rust E&I 1995a).

1.4.2.2 *SWMU 3—Former X-Ray Lagoon*

The Former X-Ray Lagoon was constructed in 1974 to receive diluted spent developer and fixer solutions from the Film Processing Building (Building 1223). The lagoon, measuring 75 feet long by 35 feet wide and 6 feet deep, is located across the road from Building 1223. It was lined with 100-mil plastic-sheeting liner covered by a few inches of gravel. The X-ray development process was operated intermittently, running approximately 8 hours per day for 6 months of the year from 1974 through 1990. All water discharged from the building was carried to the lagoon through an 8-inch ceramic pipe. While in operation, the X-Ray Lagoon is estimated to have received 16,800 gallons of wastewater and 120 gallons of spent developer per year. This SWMU also contained a suspected area of waste discharge referred to as the "Standing Liquid Area" on the basis of aerial photographs and as evidenced by an area of trees and other vegetation. It also includes a septic system suspected to have received contaminants. COPCs for this SWMU include metals and SVOCs (Rust E&I 1995a).

1.4.2.3 *SWMU 9—Drummed Radioactive Waste Storage Area*

The Drummed Radioactive Waste Storage Area consists of a concrete pad and adjacent field

area that was used for the temporary storage of containerized low-level radioactive waste. The material was stored for a number of years on or around a concrete pad southwest of Building S-753. It was then moved to a field area to the northwest of the building. In 1978, the material was removed for off-site disposal by the TEAD Radiation Protection Office. The materials reportedly included transmitting tubes used to generate microwaves for radar systems and possibly speedometers, luminous watch dials, contaminated tools, and decontamination materials. There are no records that identify the exact storage locations of the containerized waste and no indication that any radioactive spills have occurred at SWMU 9. Currently, a small wooden shed is located on the concrete pad thought to have been used for container storage. One drum was suspected to have been moved to an area in Lot 707, which is now used for storage of 4-wheel-drive vehicles. Based on investigations conducted to date at this SWMU, there are no COPCs. The ROD for OU 6, which consists of SWMUs 9 and 18, was signed in September 1994. The no action alternative was selected as the remedial alternative to be implemented for both SWMUs (Rust E&I 1994a).

1.4.2.4 *SWMU 12—Pesticide Disposal Area*

The Pesticide Disposal Area is in the area of the Sanitary Landfill (SWMU 15), but the precise location of the disposal site has still not been determined. The area was reportedly a trench where barrels containing small amounts of pesticides were emptied prior to disposal. This activity is thought to have ceased in 1982 or 1983, although the site was not identified until 1987. Since the precise location of this SWMU is unknown, COPCs for this SWMU are considered to be the same as for the Sanitary Landfill (SWMU 15) and include VOCs, pesticides, SVOCs, metals, and PCBs (Rust E&I 1995a).

1.4.2.5 *SWMU 13—Tire Disposal Area*

The Tire Disposal Area is a large pit from previous gravel-mining operations. The area covers approximately 11 acres in the southern portion of TEAD. Unreclaimable tire carcasses from TEAD vehicles had been disposed of in the former gravel-mining pit since 1965. Thousands of tires were placed on the ground surface of the pit and, in some areas of the pit, the tires were covered with gravel. The majority of the tires, however, were exposed on the ground surface. In 1993, the tires were removed. Based on investigations conducted to date at this SWMU, SVOCs and VOCs were the COPCs identified for this SWMU and were found in both surface and subsurface soil at low concentrations (Rust E&I 1997).

1.4.2.6 *SWMU 14—Sewage Lagoons*

The Sewage Lagoons are located on the western side of the maintenance area of TEAD, approximately 2,000 feet northwest and downgradient of the Sanitary Landfill (SWMU 15). Prior to 1974, sewage was discharged to evaporation lagoons located in the landfill and to the

arroyo immediately south of the landfill. In 1974, the existing two sewage lagoons were constructed and began receiving wastewater from housing and warehouses in the maintenance and administrative areas. Only sanitary sewage has been discharged to these lagoons since their construction. Each lagoon is approximately 7.4 acres in surface area and 4 feet deep. The capacity of each lagoon is approximately 9 million gallons, and the average daily flow rate to the lagoons is approximately 90,000 gallons. The lagoons were designed so that the first lagoon initially fills with wastewater and then discharges to the second lagoon. Under normal operating conditions when evaporation rates are high (spring, summer, and fall), only the first lagoon remains filled. The second lagoon occasionally receives discharge from the first lagoon only during winter months. Although the lagoons are lined with native clay, they are suspected to be leaking with estimates of 60 to 70 percent of the effluent percolated into underlying soils. COPCs at this SWMU include heavy metals and SVOCs (SAIC 1996a).

1.4.2.7 *SWMU 15—Sanitary Landfill*

The Sanitary Landfill is located in an arroyo at the southern end of the open revetment area. The landfill is approximately 100 acres in size and has been in operation since 1942. The landfill is accessed by Incinerator Road and has received both hazardous and nonhazardous wastes during its operation. No records exist that detail waste types or placement in the landfill. Areas of the landfill were used for the burial of construction wastes, domestic wastes, and asbestos. TEAD personnel have indicated that such items as empty paint and stripper containers, garbage, spent ethylene glycol, scrap wood, battery acid containers, pesticide and herbicide containers, plastic-bagged asbestos-contaminated materials, hydrogen cyanide, salts, and boiler fuels and residues have been disposed of at the landfill. Since it has been in use for over 50 years, many other types of wastes may be buried in the landfill. Past waste management practices consisted of burying the waste in trenches. A more recent practice consisted of placing the waste in natural depressions and covering it with soils from the surrounding area. In the spring of 1994, the landfill was closed to the disposal of wastes with the exception of construction rubble and debris. COPCs for this SWMU include VOCs, pesticides, SVOCs, metals, and PCBs (Rust E&I 1995a).

1.4.2.8 *SWMU 17—Former Transformer Storage Area*

The Former Transformer Storage Area refers to Open Storage Lot No. 675B, located in the northern portion of the Maintenance Area approximately 500 feet northwest of Building S-670. The lot is graveled and covers approximately 5 acres. One of the responsibilities of TEAD has been the receiving, storage, maintenance, and shipment of oil-containing electrical transformers and capacitors. Prior to 1979, there was long-term storage of thousands of transformers and capacitors on Lot 675B. Many of these transformers contained PCB oils. In 1979, all transformers were removed from the lot and disposed of or transferred to Building 659 for storage. Building 659 has continued to operate as the transformer storage facility since 1979. Lot 675B is currently used for the storage of vehicular equipment. A drainage ditch is

present along the northern edge of the lot, which parallels the adjacent road. Based on previous investigations, there are no COPCs for this SWMU. The ROD for OU 5, which consists of SWMUs 17 and 33, was signed in September 1994. The no action alternative was selected as the remedial alternative to be implemented for both SWMUs (Rust E&I 1994a).

1.4.2.9 *SWMU 18—Radioactive Waste Storage Building S-659*

The Radioactive Waste Storage Building S-659 is located in the northeastern corner of Building 659, which is also the building used for the storage of transformers (SWMU 33). The Radioactive Waste Storage Area consists of a secured room within Building 659, which is licensed by the Nuclear Regulatory Commission (NRC) to store low-level radioactive materials. The room has a bermed concrete floor and is enclosed and isolated from the remainder of the building. Materials stored in this area include radiation-detection meters, compasses, sights, range finders, radioactive luminous compounds, and depleted uranium. The wastes are stored in Department of Transportation (DOT)-approved containers. Periodic monitoring of the facility is conducted to determine if radioactive releases have occurred. Access to the facility is controlled by a locked door. The ROD for OU 6, which consists of SWMUs 9 and 18, was signed in September 1994. The no action alternative was selected as the remedial alternative to be implemented for both SWMUs (Rust E&I 1994a). Subsequent to this action taken under CERCLA, Building 659 is being remediated under BRAC regulations for eventual turnover to the public. A closure report, which includes investigation for residual radioactive materials, is in preparation. Current results indicate no further action will be necessary for radioactive materials.

1.4.2.10 *SWMU 24—Battery Pit*

The Battery Pit consists of Building 507 and an 8-foot-wide by 12-foot-long by 8-foot-deep pit reportedly located southeast of the Building. Building 507 was used for the maintenance and repair of automotive batteries until 1980. In 1980, the battery maintenance activities were moved to Building 1252 (SWMU 25). At Building 507, electrolyte from lead-acid batteries was reportedly discharged through a floor drain to the battery pit, which was filled with lime to neutralize the battery acid. The discharge area was considered a potential pathway for contaminants in subsurface soils through accidental spills or building washdown activities. The suspected location of the battery pit, which is now covered by asphalt, was thought to contain metal contaminants in soil such as lead, chromium, and cadmium. It was also suspected that the pH of the soils may have been affected if the lime failed to neutralize the acidic effluent prior to leaving the pit. However, the lime-filled pit, as previously described, could not be located during the Phase II RFI. Instead, a concrete sump containing sediment with elevated concentrations of metals was located. TEAD plans to remove the sump and associated piping. COPCs for this SWMU are metals (Rust E&I 1995a).

1.4.2.11 *SWMU 26—DRMO Storage Yard*

The DRMO primarily coordinates the sale, recycling, and disposal of TEAD refuse, and handles the contractual aspects of hazardous waste disposal for TEAD. The DRMO is contained in a fenced yard that covers 60 acres in the eastern section of the Maintenance Area. Several corrugated steel storage buildings occupy portions of the SWMU. Storage times vary according to waste types, ranging from a few months to several years. The DRMO Storage Yard is flat and unpaved, and the surface has been reworked and leveled. Previous photographs of the storage yard showed areas of ground staining, drum storage, and debris piles. Materials previously stored in the yard include paints, solvents, photographic developing solutions, batteries, waste oil, scrap metals, and small quantities of oxidizers, corrosives, and acids. COPCs for this SWMU include metals and SVOCs (SAIC 1996a).

1.4.2.12 *SWMU 27—RCRA Container Storage Area*

The RCRA Container Storage Area, located in the TEAD Administration Area, is a locked building (Building 528) that is completely surrounded by a chain-link perimeter fence. The floor slab was constructed in 1980, and the building was added in 1986. This facility is currently regulated under interim status for long-term storage of hazardous waste generated at TEAD while the RCRA Part B application is being reviewed by various regulatory agencies. Wastes stored in this building require treatment before disposal. The containerized wastes are segregated according to chemical characteristics by an x-shaped concrete berm that divides the building into four parts. Inside the building, bermed areas 1 and 3 contain ignitable wastes such as solvents, oils, paints, thinners, and enamels; area 2 contains ash from the heating plant furnace and plating solutions from metal plating shops; and area 4 contains corrosives (acids and bases). Each of the four bermed storage areas are connected to separate PVC drain lines that extend outside the building and have their ends capped. If a spill occurs, these pipes drain the liquid through the perimeter wall where the drain is uncapped and the material containerized. Based on the investigations conducted to date, there are no COPCs at this SWMU (Montgomery-Watson 1993).

1.4.2.13 *SWMU 28—90-Day Drum Storage Area*

The 90-Day Drum Storage Area is a 3.4-acre fenced lot near the southern end of the Maintenance Area located adjacent to the northern region of the Drum Storage Area (SWMU 29) and immediately east of the Sanitary Landfill (SWMU 15). Until 1983, when the 90-Day Drum Storage Area was constructed, the area had been used for vehicle storage. Currently, drummed wastes including gasoline, phosphoric acid, sodium hydroxide, paint wastes, thinners, solvents, paint filters, blast grit, used oil, and antifreeze are stored above ground on pallets in this area. Drums remain sealed and are stored up to 90 days before being transported off the depot to a hazardous waste management facility or to the permanent storage

facility in Building 528. COPCs at this SWMU include metals and total recoverable petroleum hydrocarbons (SAIC 1996a).

1.4.2.14 *SWMU 29—Drum Storage Areas*

SWMU 29 consists of two Drum Storage Areas (northern and southern) located near the southern end of the Maintenance Area. The two areas are separated by the Maintenance and Supply Road. The southern area (also known as the old lumber yard) is a fenced 25-acre expanse of gravel and broken asphalt surface with a single warehouse (Building 576). Historical aerial photographs show that the southern part of SWMU 29 has been used for the storage of drums, as well as cylinders, tanker trucks, and lumber. The northern area is a triangular-shaped, sparsely vegetated, open area of approximately 5 acres. Drums and old vehicles have historically been stored in this area. The Drum Storage Areas were used to store empty drums before they were returned to the originating contractor. Empty drums were reported to have been stored upside down to allow residual contents to drain and to keep precipitation out. COPCs for this SWMU include metals, cyanide, total petroleum hydrocarbons, SVOCs, and pesticides (SAIC 1996a).

1.4.2.15 *SWMU 30—Old Industrial Waste Lagoon*

The Old Industrial Waste Lagoon (OIWL) consists of a gravel pit, some areas of former standing liquid (referred to as lagoons) and ground staining, and a number of ditches located northwest of the maintenance area. Before the construction of the IWL (SWMU 2) in 1965, liquid wastes containing solvents and heavy metals from maintenance operations (degreasing, metal cleaning, stripping, and painting) were discharged to a widespread area referred to as the Old Industrial Waste Lagoon. The OIWL was operated for approximately 20 years at an estimated discharge of 125,000 gallons of wastewater each day. Portions of the OIWL were remediated as part of a RCRA remediation of the IWL (SWMU 2). Other portions have been paved for roads. Many of the ditches from the OIWL intermingle with ditches for the IWL. The COPCs at this SWMU include metals and SVOCs (Rust E&I 1995a).

1.4.2.16 *SWMU 33—PCB Storage Building 659*

The PCB Storage Facility in Building 659 is a Toxic Substances Control Act (TSCA)-regulated facility used to store transformers. The facility has a sealed cement floor and a perimeter berm and diversion structures at each entrance for the containment of oil spills. The surface around the building is also paved. The facility began operating in 1979 and is used to store thousands of transformers that were once stored in open storage sites. The transformers are stored on open pallets and in wooden crates within the building. According to facility personnel, PCB-transformers are still being removed from TEAD, with temporary storage occurring at Building 659 during the removal process. Because there are no indications of any contaminant releases, there are no COPCs for this SWMU. The ROD for OU 5, which consists of

SWMUs 17 and 33, was signed in September 1994. The no action alternative was selected as the remedial alternative to be implemented for both SWMUs (Rust E&I 1994a). As noted in Section 1.4.2.9 (SWMU 18), subsequent to CERCLA no-action decision, Building 659 is being remediated under BRAC for eventual turnover to the public. Remedial design and remedial action are underway.

1.4.2.17 *SWMU 34—Pesticide Handling and Storage Area*

The Pesticide Handling and Storage Area is located in Building 518 in the Administration Area. This facility is constructed of flame retardant material and has bermed, sealed, concrete floors. The facility is being decommissioned, and no future pesticide-related activities are planned. Pesticides and herbicides have been stored in separate vented and locked rooms. The mixing/formulation area is located in the building but separated from the storage area by bermed concrete. The facility is vented and equipped with backflow prevention devices on the water lines used at the facility. In recent years, a bermed concrete pad for loading sprayer trucks has been added to the south side of the building. Activities associated with the building have included storage and mixing/formulation of pesticides, filling tanks with pesticides, and rinsing containers. Pesticides and herbicides stored at this facility have included DDT, 2,4-D, and Roundup®. Drains from the building originally discharged via an 8-inch-diameter underground pipe to the Stormwater Discharge Area (SWMU 45) located approximately 4,000 feet northwest of the building. Currently, there are no discharges from the Pesticide Handling and Storage Area. All drains have been blocked, and wash water is contained in a catch tank located on the north side of the building. When the facility was in operation, disposal was conducted by a subcontractor at an off-depot treatment and disposal facility. COPCs for this SWMU include metals, cyanide, pesticides, and herbicides (Montgomery-Watson 1996).

1.4.2.18 *SWMU 41—Box Elder Wash Drum Site*

The Box Elder Wash Drum Site is located southeast of Row J of the Igloo Storage Area. This SWMU contained 57 drums in the Box Elder Wash streambed, which carries intermittent runoff from the southwestern corner of TEAD, north through the Igloo Storage Area, and across the north-central TEAD boundary. The drums in the streambed were apparently dumped off the eastern edge and lie in the lower bank and bottom of the wash. The drums are present in a 200-foot-long stretch of the wash, and most of the drums are at least partially obscured by soil and/or vegetation. The soil covering the drums appeared to be the result of sedimentation occurring during periods of surface-water flow and by caving of the steep stream bank. The drums are in various stages of deterioration and have no obvious markings. The drums contain a black tarry substance that resembles roofing tar. There are small areas of stained soil associated with the drums and one area of a surface tar spill above the wash channel. COPCs at this SWMU include SVOCs and metals. The ROD for OU 10, which consists of SWMU 41, was signed in September 1994. Removal of the drums and excavation

of the stained soil areas were selected as the remedial alternative to be implemented for this SWMU (Rust E&I 1994a). Remedial design and fieldwork have been completed.

1.4.2.19 *SWMU 43—Container Storage Areas for P999*

Six storage igloos were used between 1985 and 1989 to store M55-type rocket parts and fuses for rocket assessment tests. Because the M55 rockets are the type used to transport chemical warfare agents, concern regarding the potential for environmental contamination from these rockets as well as the mortar rounds caused the associated storage igloos to be classified as a SWMU. Each storage igloo measures approximately 60 feet by 26 feet and is constructed from concrete and steel with a soil and grass covering. Roads servicing the igloos and the driveways leading up to the entrances are paved. Inside the igloos, troughs (one along each wall) empty into floor drains. The drains discharge to the soils beneath and are not connected to any treatment system; no liquids have been used in the igloos. Based on a review of records for the igloos, there are no COPCs for this SWMU (Montgomery-Watson 1993).

1.4.2.20 *SWMU 44—Tank Storage of Trichloroethylene*

From 1971 to 1984, the southern end of Building 620 in the Maintenance Area contained an above-ground, 500-gallon, trichloroethylene storage tank. The trichloroethylene was used as a degreaser to clean small arms, ammunition, gears, and small metal parts. The tank was emptied about once a week during its heaviest usage (in the 1970s) and drained into the industrial sewers connected to the Industrial Wastewater Lagoon, which have since been excavated and capped. In 1984, usage of the tank was discontinued, but it was left in the building. In April 1991, the tank was turned over to the DRMO yard for salvage. Because neither the tank nor contamination originating from the tank remains, no further action is recommended for this SWMU (Montgomery-Watson 1993).

1.4.2.21 *SWMU 46—Used Oil Dumpsters*

Seventeen dumpsters were located around the maintenance area. These locations include Buildings 507, 509, 511, 522, 600, 602, 607, 611, 619, 620, 637, and 691. Used oil from vehicle maintenance operations was stored in dumpsters at each of these buildings. The used oil was routinely pumped from the dumpsters for off-site disposal by an oil recycling contractor. The primary COPCs at this site are metals and total recoverable petroleum hydrocarbons (SAIC 1996a).

1.4.2.22 *SWMU 52—Drain Field and Disposal Trenches*

This SWMU consists of a Possible Drain Field (SWMU 52A) located northwest of the Skeet

Range and Disposal Trenches (SWMU 52B) adjacent to the southeast boundary of the depot in the TEAD Administration Area. The Possible Drain Field is located in a large open field northwest of the Skeet Range. Visible trenches and remnants of possible leach lines interconnect and create a system of surficial depressions. A concrete pad approximately 10 by 23 feet is located in the center of this system of trenches. Pieces of terra cotta piping are evident near the surface of the trenches throughout the drain field system. The disposal trenches consist of a long mounded trench, approximately 150 by 40 feet, and several smaller mounds that are also considered part of the former disposal trenches. Pieces of construction rubble and debris are present at the surface of the mounds and buried throughout the mounded area. During the field investigation, two additional areas of interest were identified and subsequently investigated: a field containing remnant black material designated SWMU 52C and the Horse Stable Area designated SWMU 52D. Based on the investigations, there are no COPCs at either the Drain Field or Disposal Trench sites. COPCs at SWMU 52C are VOCs and SVOCs. COPCs at the Horse Stable Area are pesticides (SAIC 1996b).

1.4.2.23 *SWMU 53—PCB Storage/Spill Sites (Buildings 659, 679)*

This SWMU consists of potentially contaminated exterior areas of the ground surface, adjacent to buildings 659 and 679. Building 659 is a TSCA-permitted facility for storage of PCB transformers prior to their shipment to a disposal facility. Building 679 was the site of a former PCB spill where cleanup activities were conducted but not adequately documented. It is suspected that PCB contamination of surrounding soils may have occurred (SAIC 1996b). PCBs are the COPCs at this SWMU.

1.4.2.24 *AOC-3-Extraction Well 15*

This site is located in the northern portion of the Open Revetment Area of TEAD, approximately 3,000 feet northwest of the air-stripping treatment plant. The site is remote and relatively inaccessible. It is surrounded by open revetments used for short-term storage of ammunition and for cattle grazing. Suspected COPCs were VOCs. Analyses of samples taken during the RFI detected no contamination and no further action is anticipated for this AOC (SAIC 1996a).

1.4.2.25 *AOC-4-National Guard Training Site*

AOC-4 is located in a small drainage swale south of the Ordnance Area and approximately 3 miles east of the Open Burning/Open Detonation Area. The site is approximately 15 to 20 feet square and surrounded by a dilapidated snow fence. Its prior use is unknown. Analyses of samples taken during the RFI detected only two organic compounds at levels well below EPA risk-based concentrations for residential soil. No further action is anticipated at this AOC (SAIC 1996a).

1.4.3 Surveillance Testing of Munitions

Testing of munitions has been conducted since 1942. Tests were performed to assist in the design, development, and manufacture of munitions. Munitions tested at TEAD have included high explosive (HE)-filled munitions, fuses, propellants, flares, smoke grenades, smoke pots, white phosphorus (WP)-filled grenades and projectiles, bombs, small arms ammunition, flame thrower igniters, and riot-control agent-filled munitions (USATHAMA 1979). Spent munitions were disposed of in open trenches. Once the trenches were full, they were covered with earth. COPCs at these SWMUs are primarily metals, explosives, and SVOCs. Brief descriptions of each of these SWMUs are provided in the following subsections. Additional details are provided in the reports referenced in each subsection.

1.4.3.1 *SWMU 6—Old Burn Area*

The Old Burn Area is located in the south-central portion of TEAD and consists of a gently sloping, grassy area with three bermed revetments located in the eastern portion of the SWMU. Four drainages run off the north side of SWMU 6, where they are intercepted by a manmade drainage ditch. This ditch carries the runoff to the northwestern corner of the SWMU, where it exits via a culvert under the access road. This SWMU was used until the 1970s for the testing of hydrocarbon-filled smoke munitions, fuses, and propellants. It was also used to burn wooden boxes and crates both on the surface and in shallow trenches. All of the former trenches have been filled, and the area has been graded and revegetated since testing was discontinued. The primary COPCs at this SWMU are SVOCs, metals, and explosive compounds (Rust E&I 1997).

1.4.3.2 *SWMU 7—Chemical Range*

Chemical and pyrotechnic-type munitions, excluding agent-filled munitions, were tested and disposed of at the Chemical Range. Munitions tested included flares, smoke grenades, smoke pots, projectiles, incendiary items such as bombs, pouch and document destroyers, riot-control munitions, and flame-thrower igniters. At least two trenches and possibly a third were used to dispose of spent munitions following testing operations. In 1991, the two trenches were backfilled with the berm materials surrounding the trenches, and the area was graded. Northwest of the firing point, another testing area with an open trench filled with various spent munitions was identified. This area is referred to as the northwest test area trench. The remainder of the SWMU is relatively flat and covered with grass and sagebrush. COPCs for this SWMU include heavy metals, which were found throughout the SWMU (Rust E&I 1997).

1.4.3.3 *SWMU 8—Small Arms Firing Range*

The Small Arms Firing Range is located along the extreme western boundary of TEAD and has been used by the National Guard, Army Reserve, Navy, and TEAD military personnel for

training in the use of small firearms (e.g., M-16s, M-60 machine guns, and pistols). The range contains 20 firing stations with targets located at 25, 50, 100, and 200 meters. Bermed areas behind the targets were used to stop the rounds fired at the targets. Currently, the SWMU is not used. A new small arms firing range was established in 1992, and the training is now conducted at the new range. Elevated metals are the primary COPCs at this SWMU. Lead was detected at 33,000 $\mu g/g$ in one hot spot surface soil location (Rust E&I 1997).

1.4.3.4 *SWMU 19—AED Demilitarization Test Facility*

The Ammunition and Engineering Directorate (AED) Demilitarization Test Facility is located southwest of the ordnance area in a relatively remote and undeveloped portion of TEAD. The facility was constructed in 1973 and is composed of six small buildings, sheds, and a series of protective revetments behind which tests are conducted. Operations at the facility include experimental or pilot plant-type tests to determine if new design demilitarization equipment is functional, and to develop procedures, techniques, or additional equipment to implement the new design equipment. Live ammunition and propellants are frequently used during the testing. In addition to demilitarization equipment tests, propagation tests, barricade testing for explosive lines, and open burning in pans have been conducted at this facility. Actual tests are conducted intermittently during approximately 30 days each year. COPCs at this SWMU include metals, explosive compounds, SVOCs, and nitrate (SAIC 1996a).

1.4.3.5 *SWMU 20—AED Deactivation Furnace Site*

The AED Deactivation Furnace Site is located southwest of the ordnance area along the road that links the AED Demilitarization Test Facility (SWMU 19) and the Bomb and Shell Reconditioning Building (SWMU 23). SWMU 20 is used to test demilitarization procedures for various munitions and is not used as a production facility. The facility is composed of two furnaces, a large air pollution control system, and a small storage building. The deactivation furnace in Building 1351 is a rotary kiln type that has been used for the destruction of HE-filled projectiles (up to 155 mm), grenades, propellants, boosters, fuses, WP rockets, and bulk explosives. A flashing furnace was added to the AED Deactivation Furnace Site and is used for burning residuals in munition shell casings after initial treatment in the deactivation furnace. During an upgrade in 1976, a shared air pollution control system was installed to treat stack emissions from both the deactivation and the flashing furnaces. The air pollution control equipment includes duct work from the two furnaces, an after burner, cyclone, gas cooler, baghouse, and wet scrubber. After deactivation, all residual metal parts are certified as clean and sent to the DRMO for salvage. Baghouse dust and ash are collected in 55-gallon drums, which are sealed and sent to the 90-Day Storage Yard (SWMU 28) pending analysis and disposal. COPCs at this SWMU include metals and explosive compounds (Montgomery-Watson 1996).

1.4.3.6 *SWMU 21—Deactivation Furnace Building 1320*

The Deactivation Furnace Building 1320 is located in the southwestern portion of TEAD, near the southwestern perimeter of the igloo storage area. This SWMU is an ammunition demilitarization production facility constructed around 1955. The facility consists of Building 1320, which contains a rotary kiln, and open staging areas around the outside of the building. The kiln, which is an auger-type feed, was installed in 1955. The staging areas are partially covered with asphalt and with gravelly soils. The facility is used for deactivating small arms ammunition (up to 20 millimeter), primers, and fuses. Air pollution control equipment, including a cyclone, gas cooler, and baghouse, was installed in approximately 1975 to treat emissions from the furnace. Incinerator residue, which consists of ash and metal debris from the demilitarized munitions, collects at the south end of the furnace, where it is loaded into 55-gallon drums that are placed on a concrete pad. COPCs for this SWMU include metals and explosives (Montgomery-Watson 1996).

1.4.3.7 *SWMU 36—Old Burn Staging Area*

The Old Burn Staging Area consists of a small gravel pit located immediately north of the Old Burn Area (SWMU 6). SWMU 36 was used to store items to be burned or disposed of at the Old Burn Area. It is also suspected that trenching and burning of materials might have occurred at this SWMU. During the Phase I RI field investigation, it was observed that several dark stained areas were present in the pit as a result of surface burning. Contamination at SWMU 36 is restricted to heavy metals (Rust E&I 1997).

1.4.3.8 *SWMU 40—AED Test Range*

The AED Test Range is located in the northwestern portion of TEAD and has been used extensively for the testing of munitions, bombs, and rocket engines. This SWMU consists of several bermed revetments, a drop tower, a deactivation furnace (only the building foundation remains), and an observation bunker. Testing ranged from detonation of large (i.e., 1-ton) bombs to small munitions and also included the testing of rocket engines. The area contains both spent munitions and unexploded ordnance (UXO). The former deactivation furnace building was used to test the conveyor spacing for the deactivation furnace. The furnace and building were damaged as a result of explosions that took place during the testing. Fragments of propellant for rocket engines were also observed in the revetment surrounding the drop tower. One area located in the northern portion of the test range was used for the detonation of 1-ton bombs as evidenced by over 20 bomb craters. Testing in the AED Test Range was largely conducted by personnel observing them from an observation bunker located on the hill to the southeast of the testing revetments. SWMU 40 appears to have been used extensively as indicated by the UXO, metal debris from spent munitions, and rocket propellant, all of which are scattered across the site. The area is no longer used for testing. COPCs at this SWMU

include metals and explosives that were found in both surface and subsurface soil throughout the SWMU (Rust E&I 1997).

1.4.4 Demolition and Burning of Munitions

The demolition and burning areas are located in the extreme western part of TEAD. Activities at these areas (SWMUs 1, 1a, 1b, 1c, 1d) included demolition and burning of explosives, explosive-contaminated materials, riot-control agents and munitions, and disposal of WP-filled munitions through demolition and/or burning. Explosives demolition was conducted in a large area. Large pits were dug, and the material to be detonated was placed in them. The pits were covered over with earth and then detonated. Munitions detonated in these pits included everything from small arms to 12,000-pound bombs (USATHAMA 1979).

Munitions were burned in large open pits. Materials that were burned in these pits included bulk explosives, explosive-filled munitions, explosive-contaminated materials, smoke pots and grenades, bulk WP, and riot-control agent munitions (USATHAMA 1979). Once burning was complete, the metal was recovered and reburned in order to remove all residual contamination. Metals were then sent to the DRMO for salvage.

Other munitions, such as small arms ammunition, primers, and fuses, were destroyed in deactivation furnaces (Montgomery-Watson 1993). The waste dust and ash produced by the process were stored in drums on-site until disposal off-site could occur. The remaining metal was sent to the DRMO for salvage. The COPCs at these SWMUs resulting from the demolition and burning of munitions are metals, explosives, VOCs, SVOCs, dioxins/furans, and anions. Brief descriptions of each of these SWMUs are provided in the following subsections.

1.4.4.1 *SWMU 1—Main Demolition Area*

The Main Demolition Area comprises the largest part of the Open Burning/Open Demolition Area and has been used since the 1940s for various demilitarization activities, including munitions detonation, propellant flashing, and various materials disposal from the TEAD facility by burning and/or burial. SWMU 1 is currently used for emergency demilitarization of bombs and other explosive munitions. Past activities have included open burning and open detonation of numerous types of munitions and other items in open trenches. As trenches became full of debris and residue, they were backfilled and new trenches were excavated. Burial is no longer used as a means of waste disposal. COPCs at this SWMU include explosives and metals (Montgomery-Watson 1996).

1.4.4.2 *SWMU 1a—Cluster Bomb Detonation Area*

The Cluster Bomb Detonation Area (SWMU 1a) is comprised of two small areas, totaling about 25 acres in size, along the western side of the Main Demolition Area (SWMU 1). Evidence from aerial photographs and field inspection in these areas revealed several small craters where cluster bomb demilitarization was thought to have occurred. This area was reportedly used during the early and mid-1970s. Currently the area is covered by native vegetation, and SWMU 1a is no longer used for demilitarization activities. COPCs at this SWMU include metals and explosives (Montgomery-Watson 1996).

1.4.4.3 *SWMU 1b—Burn Pad*

The Burn Pad is located at the Open Burning/Open Detonation (OB/OD) Area, in the southwestern corner of the TEAD facility. The Burn Pad previously consisted of a cleared pad approximately 300 feet by 100 feet in size where propellant was burned in open trenches and projectiles were flashed. Open burning was reportedly discontinued before 1977. Analyses of aerial photographs from 1959, 1966, and 1978 revealed that five separate trenches were excavated in the pad. The area has since been regraded and revegetated. The Burn Pad is no longer in use for any demilitarization activities. COPCs at this SWMU include metals, explosives, dioxins, and furans (Montgomery-Watson 1996).

1.4.4.4 *SWMU 1c—Trash Burn Pits*

The Trash Burn Pits are located in the OB/OD Area in the southwestern corner of the TEAD facility. This SWMU consists of an area previously used for open burning of waste packaging material potentially contaminated with explosives. Large pits were excavated using heavy equipment and filled with waste materials to be burned. When the pit was filled with ash and debris, it was covered and regraded, and a new pit was dug. Pits were generally up to several hundred feet long, 8 to 10 feet wide, and 4 to 6 feet deep. The Trash Burn Pits are no longer used for any disposal activities. COPCs at this SWMU include metals, VOCs, SVOCs, dioxins, and explosive compounds (Montgomery-Watson 1996).

1.4.4.5 *SWMU 1d—Propellant Burn Pans*

The Propellant Burn Pans consist of an area of approximately 600 feet by 200 feet, which has been cleared of vegetation and equipped with eight large steel "pans." Bulk propellant scheduled for disposal is loaded into the pans and ignited with fuses. The propellant material burns down to a fine ash, which is then containerized and handled as a hazardous waste. The propellant handling and burning is conducted according to all USACHPPM-recommended best management practices. The pans are covered between burns to prevent precipitation from accumulating in them. The only wastes disposed of at SWMU 1d are the propellants that are

burned here. COPCs at this SWMU include metals and explosives (Montgomery-Watson 1996).

1.5 PHYSICAL CHARACTERISTICS

1.5.1 Physiography

TEAD is located in the Great Salt Lake Basin, a large interior drainage basin within the Basin and Range Physiographic Province. The Basin and Range Province is characterized by large fault blocks that trend approximately north and south, and form a series of interior basins bounded by fault-block mountain ranges.

The Tooele Valley, which is a topographic expression of a northward-plunging structural basin, is bounded by the north-trending Stansbury and Oquirrh Mountains, which rise from the valley floor at elevations ranging from 5,000 feet to over 10,000 feet. Topography of the valley floor is shaped by coalescing alluvial fans formed by erosional debris washed from the adjacent mountains. The valley is floored with ancestral Lake Bonneville sediments. The topography at TEAD is characterized by a gently rolling surface intersected by a series of shallow gullies that drain the facility. The average topographic gradient in the northern portion of the site is approximately 70 feet per mile, increasing to about 150 feet per mile at the southern boundary.

1.5.2 Climate

The Tooele Valley climate ranges from arid to semi-arid. Average annual precipitation at Tooele is approximately 17 inches. At Grantsville, which is 2 miles north of TEAD, the average annual precipitation is approximately 11 inches. The greatest amount of precipitation occurs in the mountains surrounding the valley, where the average is more than 40 inches per year. The normal mean annual air temperature at Tooele is approximately 51 °F although the area is characterized by hot, dry summers and cold winters. Flash flooding may occur in the valley primarily as a result of summer thunderstorms. The air temperature averages 75 °F in July and 28 °F in January; the average freeze-free period is 120 to 160 days. These relatively cool, year-round temperature conditions also limit the development of soils.

1.5.3 Geology

TEAD lies near the eastern edge of the Basin and Range Structural Province, which is characterized by fault-block mountain ranges and intervening sedimentary basins. In eastern Tooele County, the crest lines of the mountain ranges trend north-south; this is roughly parallel to the front of the Wasatch Range, which forms the eastern margin of the province.

Bedrock in the mountain ranges bordering the Tooele Valley has been extensively folded and faulted.

Tooele Valley is characterized by gravelly bajadas sloping toward and grading to a sandy and silty valley bottom. The valley floor consists of a thick sequence of unconsolidated basin-fill alluvial sediments of Tertiary and Quaternary age. The basin fill consists of an older sequence of moderately consolidated sands, gravels, silts, and clays of the Salt Lake Group (upper Tertiary) overlain by deposits of unconsolidated sand, gravel, silt, and clay (Quaternary). Although the thicknesses of basin fill vary throughout the structural basin, depths to Paleozoic bedrock at TEAD range from 0 (outcrops in the northeastern corner) to more than 2,000 feet in the south-central portion of the facility.

Bedrock beneath the unconsolidated sediments of Tooele Valley consists of alternating quartzite and limestone beds similar to the late Paleozoic rocks found in the mountains to the east, south, and west. Borehole and geophysical data indicate that bedrock in the area of TEAD occurs as a topographically high and elongated block, oriented northeast to southwest, and with deeper suballuvial flanks extending to the southwest and southeast. Bedrock consists of fine-grained, blue-gray, and black limestone with calcite-filled veins and fine-grained-to-granular white, red, and brown quartzite.

1.5.4 Soils

Soils in desert and semi-arid areas are characterized into three types: (1) the lithosols, which generally occur on slopes, ridges, and plateaus, are actively eroding "young" soils that are slightly altered examples of the parent material; (2) the regosols, which are not found at TEAD, are undeveloped soils that occur in actively shifting dunes; and (3) the aridosols, which make up most of the soil composition at TEAD, are mature desert soils. These aridosols are defined on the basis of their layers with the upper layer containing little organic matter and the lower layers consisting of clays, silts, and fine sandy materials (MacMahon 1990).

Soils that develop in semi-arid climates generally are deep, well drained, moderately permeable, and alkaline. In addition, these soils have a moderate water-erosion potential and a slight wind-erosion potential. Hydraulic conductivities of the soil in the TEAD area range from 1×10^{-2} to 1×10^{-4} centimeters per second (Montgomery-Watson 1992).

Figure 1-5 shows the different soil types found in the vicinity of the TEAD facility. These soils, which developed in alluvial deposits or lacustrine sediments, consist primarily of gravelly loam, loam, or fine sand. The U.S. Department of Agriculture, Natural Resources Conservation Service (formerly the Soil Conservation Service) has identified eight primary soil series at this location: the Abela, Berent, Hiko Peak, Birdow, Medburn, Taylorsflat, Doyce,

and Manessa. Additionally, two miscellaneous types have also been described: Borrow Pits and Disturbed Areas.

Within the northeastern portion of TEAD, the soils are primarily classified as Manessa silt loam and Abela very gravelly loam. The southeastern portion of the TEAD facility area is a mixture of soils, including the Abela very gravelly loam, borrow pits (disturbed), and Doyce loam mapping units. The north-central portion of the site is largely dominated by the Taylorsflat loam mapping unit, and in the south-central area of the site, the soils are dominated by the Berent-Hiko Peak Complex. The western portion of the facility area is comprised largely of soils from the Hiko Peak gravelly loam, with fingers of Berent-Hiko Peak Complex and Hiko Peak-Taylorsflat Complex, and Birdow loam mapping units.

Because of the low precipitation, soil productivity within this region is low and concretionary layers may form resulting in decreased vegetative cover. This, in turn, reduces the amount of organic matter in the soil, which decreases water-holding capacity. Additionally, because of the low precipitation, the translocation of salts, minerals, and clays, and the resulting formation of soil horizons are limited. With a deficiency of water, dry soils do not develop strong diagnostic horizons (identification layering) except for salt crusts or concretionary layers. During dry periods, water can be drawn through the soil by capillary action and evaporate either in the soil profile or at the ground surface. Layers of caliche (a layer of calcium hardpan) or other evaporite salts may accumulate in desert soils in this manner. The long-term effects of cattle grazing and vehicle usage (soil compaction and gravel cover alteration) are readily visible and add to the low soil productivity.

Soil crusting also affects soil productivity. It reduces infiltration rates, thereby limiting both the depth to which salts are leached and the depth to which roots can penetrate. Many of the soils in this area are susceptible to forming a surface crust. The sparse vegetative cover exposes more soil to raindrop impact. Raindrop impact tends to compact the soil surface and break down the soil-surface structure into a massive condition. This reduces the amount of large pore space available for infiltration. The high sodium content of many soils in the region disperses soil particles, which results in a naturally poor soil-surface structure. Natural erosion rates of soils within the region are high. This is caused by low vegetative cover, soil crusting, low organic matter content, and easily eroded parent materials.

The characteristics of soil types identified on the TEAD facility are presented in Table 1-2. These characteristics include the mapping unit, soil type, origin of the soil, general location of the soil in the landscape, the texture, depth, pH, permeability, and infiltration rate.

1.5.5 Surface Hydrology

Approximately 17,000 acre-feet of water are discharged each year into Tooele Valley by ephemeral and perennial streams originating from the surrounding mountains. There are five predominant perennial streams entering the valley, four originating in the Stansbury Mountains

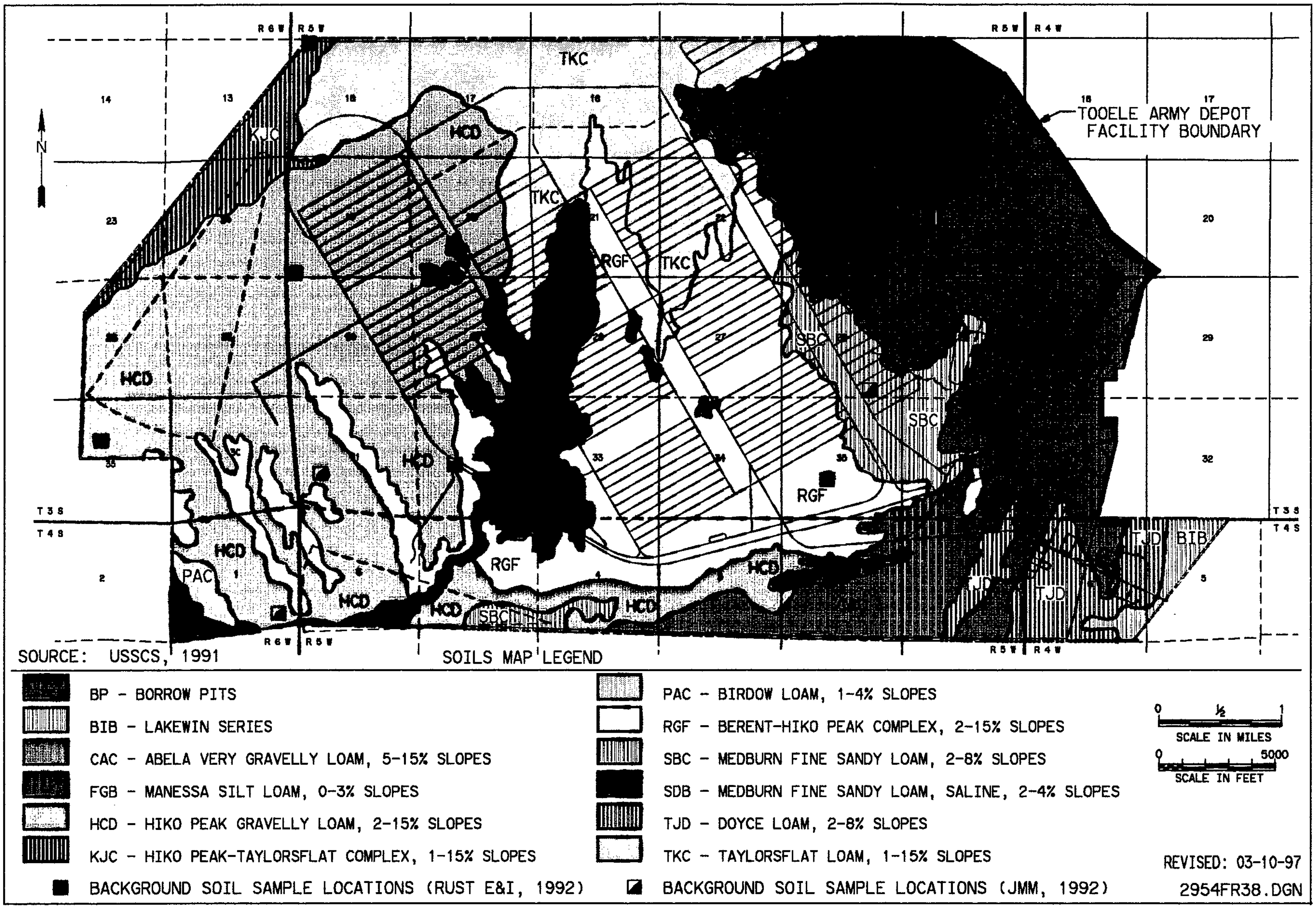

Figure 1-5. Soil Type Map at TEAD

Table 1-2. General Characteristics of TEAD Surface Soil

Mapping Unit	Soil Type	Origin	General Location	Characteristics: Texture*	Depth (feet bgs)	Soil pH	Permeability	Infiltration Rate (cm/sec)
Abela. Included in this unit are Borvant and Birdow soils.	Abela	Developed in alluvium derived primarily from limestone and quartzite.	Alluvial fans on 1 to 8 percent slopes at elevations of 4,600 to 6,000 feet above MSL[e].	Gravelly loam (GM[a]-GC[b]; SC[c]-SM[d])	0 to 0.8	7.9 to 8.4	Mod. rapid	$1.4x10^{-3}$ to $4.2x10^{-3}$
				Very gravelly loam (GC-GM)	0 to 1.7	7.9 to 9.0	Mod. rapid	$1.4x10^{-3}$ to $4.2x10^{-3}$
				Very gravelly loam to extremely gravelly sandy loam (GM-GC; GP[f]-GM)	1.7 to 5	8.5 to 9.0	Mod. rapid	$1.4x10^{-3}$ to $4.2x10^{-3}$
	Borvant	Developed in alluvium derived predominantly from limestone.	Shallow soil over a carbonate cemented hardpan on fan terraces on short or medium length, convex, 2 to 15 percent slopes at elevations of 5,200 to 6,500 feet above MSL.	Gravelly loam (GM-GC, SC-SM)	0 to 0.5	7.4 to 9.0	Moderate	$4.2x10^{-4}$ to $1.4x10^{-3}$
				Very gravelly loam (GM-GC)	0.5 to 1.5	7.9 to 9.0	Moderate	$4.2x10^{-4}$ to $1.4x10^{-3}$
				Indurated	1.5	NA[g]	NA	NA
Berent-Hiko Peak Complex. Included in this unit are Amtoft, Medburn, Sprager, Taylorsflat, Duneland, and Rock Outcrop soils	Berent	Eolian sands derived from mixed rock types.	Hummocky vegetated sand dunes and fan terraces up to 30 percent slopes at elevations of 4,500 to 5,800 feet above MSL.	Loamy fine sand (SM)	0 to 0.5	7.4 to 8.4	Rapid	$4.2x10^{-3}$ to $1.4x10^{-2}$
				Fine sand (SM)	0.5 to 5	7.9 to 9.0	Rapid	Greater than $1.4x10^{-2}$
	Hiko Peak	Developed in alluvium from mixed rock types.	Alluvial fan terraces on medium length, convex, 2 to 15 percent slopes at elevations of 4,400 to 6,000 feet above MSL.	Gravelly loam (GM-GC)	0 to 0.5	7.9 to 8.4	Mod. rapid	$1.4x10^{-3}$ to $4.2x10^{-3}$
				Very gravelly loam (GM-GC)	0.5 to 1	7.9 to 9.0	Mod. rapid	$1.4x10^{-3}$ to $4.2x10^{-3}$
				Very gravelly loam (GM-GC)	1 to 5	8.5 to 9.0	Mod. rapid	$1.4x10^{-3}$ to $4.2x10^{-3}$
	Amtoft	Developed in alluvium derived from mixed rock types.	Rock outcrops on 30 to 70 percent slopes.	Very cobbly loam (GM-GC)	0 to 1	7.9 to 9.0	Mod. rapid	$1.4x10^{-3}$ to $4.2x10^{-3}$
				Extremely cobbly loam (GM-GC; GP-GC)	1 to 1.5	7.9 to 9.0	Mod. rapid	$1.4x10^{-3}$ to $4.2x10^{-3}$
				Unweathered bedrock	1.5	NA	NA	NA

Table 1-2. *General Characteristics of TEAD Surface Soil (continued)*

Mapping Unit	Soil Type	Origin	General Location	Characteristics: Texture*	Depth (feet bgs)	Soil pH	Permeability	Infiltration Rate (cm/sec)
Berent-Hiko Peak Complex. Included in this unit are Amtoft, Medburn, Sprager, Taylorsflat, Duneland, and Rock Outcrop soils	Spager	Developed in alluvium derived from limestone.	Alluvial fan terraces on 2 to 15 percent slopes at elevations of 5,200 to 6,200 feet above MSL.	Gravelly loam (GM-GC; SC-SM)	0 to 0.5	7.4 to 9.0	Mod. rapid	1.4×10^{-3} to 4.2×10^{-3}
				Very gravelly loam, very gravelly fine sandy loam (GM-GC)	0.5 to 2	> 8.4	Mod. rapid	1.4×10^{-3} to 4.2×10^{-3}
				Indurated	2	NA	NA	NA
	Taylorsflat	Alluvium and lacustrine sediments derived from mixed rock types.	Lake terraces and alluvial fan terraces on medium length, linear to convex, 1 to 5 percent slopes at elevations of 5,000 to 6,000 feet above MSL.	Loam (CL[e]-ML[f])	0 to 0.5	7.9 to 8.4	Mod. slow	4.2×10^{-4} to 1.4×10^{-3}
				Loam (CL-ML)	0.5 to 1.0	7.9 to 8.4	Mod. slow	1.4×10^{-4} to 1.4×10^{-3}
				Loam (CL-ML)	1.0 to 5	8.5 to 9.0	Mod. slow	1.4×10^{-4} to 1.4×10^{-3}
	Duneland	Sand; derived from mixed rock types.	Ridges and intervening troughs made of fine sand sized particles on lake plains and low lake terraces.	Sand (SM-SW[g])	NA	NA	NA	NA
	Rock Outcrop	Dependent on the type of bedrock.	Exposures of barren bedrock that occur mainly on escarpments or ridges. Slopes range from 30 to 60 percent.	NA	NA	NA	NA	NA
Medburn. Included in this unit are Hiko Peak and Taylorsflat soils.	Medburn	Developed in alluvium and lacustrine sediments, derived predominantly from sedimentary rocks.	Lake terraces and alluvial fan terraces on short or medium length, convex or linear, 2 to 8 percent slopes at elevations of 4,500 to 5,800 feet above MSL.	Fine sandy loam (SM; SC-SM)	0 to 0.5	7.9 to 8.4	Mod. rapid	1.4×10^{-3} to 4.2×10^{-3}
				Fine sandy loam (SM; SC-SM)	0.5 to 3.5	7.9 to 9.0	Mod. rapid	1.4×10^{-3} to 4.2×10^{-3}
				Fine sandy loam (SM; SC-SM)	3.5 to 5	8.5 to 9.0	Mod. rapid	1.4×10^{-3} to 4.2×10^{-3}

Table 1-2. General Characteristics of TEAD Surface Soil (continued)

Mapping Unit	Soil Type	Origin	General Location	Characteristics: Texture*	Depth (feet bgs)	Soil pH	Permeability	Infiltration Rate (cm/sec)
Birdow. Included in this unit are Erda and Lakewin soils.	Birdow	Developed in alluvium derived predominantly from limestone and quartzite.	Flood plains, stream terraces, and alluvial fans on long, linear, or slightly concave 1 to 4 percent slopes at elevations from 4,250 to 6,200 feet above MSL.	Loam (CL-ML)	0 to 2.3	7.4 to 8.4	Moderate	4.2×10^{-4} to 1.4×10^{-3}
				Loam (CL-ML)	2.3 to 5	7.9 to 9.0	Moderate	4.2×10^{-4} to 1.4×10^{-3}
	Manessa	Developed in alluvium from sedimentary rocks	Fan terraces and lake terraces, 0 to 3 percent slopes at elevation of 4250 to 4800 feet above MSL.	Silt loam (CL-ML)	0 to 1	7.9 to 9.0	Mod. slow	NA
				Silt loam (CL-ML, CL)	1 to 5	> 8.4	Mod. slow	NA
	Doyce	Developed in mixed alluvium on fan terraces	Fan terraces with 2 to 8 percent slopes at elevation of 4800 to 6300 feet above MSL.	Clay (CL)	0 to 1	6.6 to 7.8	Slow	NA
				Clay (CL)	1 to 2	7.4 to 8.4	Slow	NA
				Clay (CL)	2 to 5	7.9 to 9.0	Slow	NA
	Lakewin	Developed in alluvium and lacustrine sediments on lake terraces	Lake terraces on 1 to 5 percent slopes of 4700 to 5200 feet above MSL.	Silty gravelly loam (GM-GC, SC-SM, SM)	0 to 0.7	6.6 to 7.3	High	NA
				Gravelly, sandy, clay loam (GM-GC, SC-SM)	0.7 to 1.5	6.6 to 7.8	Mod. high	NA
				Gravelly sandy loam (GM)	1.5 to 2.5	7.9 to 8.4	High	NA
				Gravelly sandy loam (GP, SP)[(k)]	2.5 to 5.0	7.9 to 8.4	Very high	NA
	Erda	Developed in alluvium and lacustrine sediments derived from mixed rock types.	Alluvial fan terraces and lake terraces on 1 to 5 percent slopes at elevations of 4,250 to 6,000 feet above MSL.	Silt loam (CL-ML)	0 to 1	7.4 to 8.4	Mod. slow	1.4×10^{-4} to 4.2×10^{-4}
				Silt loam (CL-ML)	1 to 3	7.9 to 9.0	Mod. slow	1.4×10^{-4} to 4.2×10^{-4}
				Silt loam, silty clay loam (CL-ML)	3 to 5	7.9 to 9.0	Mod. slow	1.4×10^{-4} to 4.2×10^{-4}

Source: Montgomery-Watson, 1992.
*Soil nomenclature from United Soil Classification system.
[a]Silty gravels, gravel-sand-silt mixtures.
[b]Clayey gravels, gravel-sand-clay mixtures.
[c]Clayey sands, sand-clay mixtures.
[d]Silty-sands, sand-silt mixture.
[e]Mean sea level.
[f]Poorly graded gravels, gravel-sand mixtures, little or no fines.
[g]Not available.
[h]Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
[i]Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity.
[j]Well-graded sands, gravelly sands, little or no fines.
[k]Poorly graded sands, gravelly sands, little or no fines.

(Davenport, North and South Willow, and Box Elder Canyons) and one flowing out of the Oquirrh Mountains (Settlement Canyon). Each of these streams is diverted for irrigation after the stream exits the canyons.

There are no perennial streams at TEAD; however, the western boundary is intersected by ephemeral stream drainages from South Willow and Box Elder Canyons. South Willow Creek, which has an estimated annual flow of 4,830 acre-feet, is located along the northwest boundary of TEAD and flows to the northeast. The second ephemeral stream, Box Elder Wash, has an annual discharge of approximately 900 acre-feet and almost bisects TEAD, flowing to the north. Only after heavy rain or during the runoff of rapidly melting mountain snowpacks does surface water carried in these drainages actually reach the facility.

Wetlands delineation studies have been conducted across portions of TEAD, resulting in the identification of four different classes of manmade wetlands in two locations (Figure 1-6) (although they are not true wetlands according to the U.S. Army Corps of Engineers). It is important to note that portions of TEAD have not been included in the wetlands delineation performed by either the USFWS or private wetlands delineation consultants.

1.6 ECOLOGICAL CHARACTERISTICS

1.6.1 Regional Vegetation

The Tooele Valley region is classified as a cold semi-desert, characterized by sagebrush and saltbush plant species. Soil and plant-community development are, to a great extent, a function of precipitation and temperature. The amount of precipitation available during the growing season is a primary factor in determining the type of species present, number of individuals, and the general productivity of the vegetation and soils of the area. In addition to adapting to low precipitation and high evaporation rates, plants in this area have adapted to moderately eroded soil, and some have adapted to alkaline and saline soils.

1.6.2 Site-Specific Vegetation Communities

The vegetation composition of the TEAD facility is similar to the regional vegetation. The area reflects site-specific conditions such as moderate slope, moisture condition, aspect, and soils of the area, as well as the facility's history of disturbance and human activities. Table 1-3 lists plant species observed and/or potentially occurring at TEAD.

Eight range site types were identified within the TEAD facility area. These are identified in Figure 1-7 and described in Table 1-4, along with the number of acres of each site type at TEAD and the percentage they represent. The range site types, with dominant vegetation in parentheses, are as follows: (1) Semidesert Sand (Utah Juniper)--Semidesert Gravelly Loam (Wyoming Big Sagebrush), (2) Semidesert Gravelly Loam (Wyoming Big Sagebrush)--

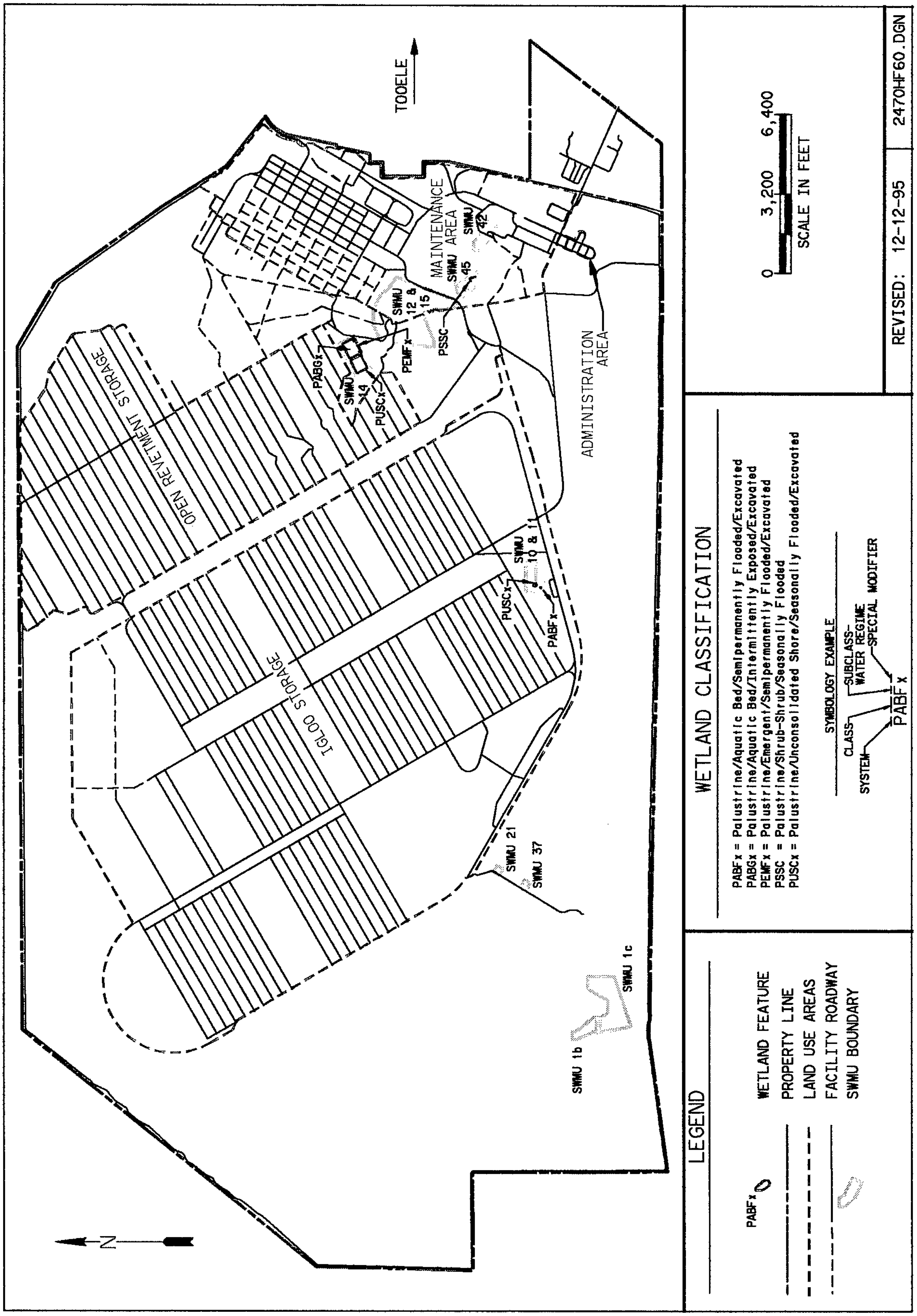

Figure 1-6. TEAD Wetlands Delineation Map

Table 1-3. Plant Species at TEAD

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
	Shrubs and Subshrubs			
Family: Aceraceae	**Maple**			
Acer negundo	Boxelder	x[a]	y[b]	
Family: Anacardiaceae	**Sumac**			
Rhus aromatica	Squaw Berry	x	y	
Family: Asteraceae	**Composite**			
Artemisia nova	Black Sagebrush	x	y	
Artemisia spinescens	Bud Sagebrush	x	y	
Artemisia tridentata	Big Sagebrush (Valley/Basin)	x	y	
Chrysothamnus spp.	Yellowbrush/Rabbitbrush			
Chrysothamnus douglasii	Little Rabbitbrush	x	y	
Chrysothamnus nauseosus	Rubber Rabbitbrush	x	y	
Chrysothamnus viscidiflorus	Green Rabbitbrush	x	y	
Tetradymia glabrata	Littleleaf Horsebrush		*l*[c]	
Tetradymia spinosa	Spiny Horsebrush		*l*	
Family: Caprifoliaceae	**Honeysuckle**			
Sambucus caerulea	Blue Elder/Elderberry	x	y	
Family: Chenopodiaceae	**Goosefoot**			
Atriplex canescens	Four-wing Saltbush	x	y	
Atriplex confertifolia	Shadscale/ Spiny Saltbush	x	y	
Atriplex falcata	Sickle Saltbush	x	y	
Atriplex gardneri	Gardner Saltbush		*l*	
Atriplex rosea	Tumbling Saltweed		*l*	
Atriplex tridentata	Trident Saltbush	x	y	
Sarcobatus vermiculatus	Black Greasewood	x	*l*	
Family: Elaeagnus	**Oleaster**			
Elaeagnus angustifolia	Russian Olive	x	y	
Family: Ephedraceae	**Joint Fir**			
Ephedra viridis	Mormon Tea/Green Ephedra	x	y	

Table 1-3. Plant Species at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Cypressaceae	**Cypress Family**			
Juniperus osteosperma	Utah Juniper	x	y	
Juniperus scopulorum	Rocky Mountain Juniper		*l*	
Family: Rosaceae	**Rose**			
Coleogyne ramosissima	Blackbush		*l*	
Prunus virginiana ssp. melanocarpa	Chokecherry		*l*	
Purshia mexicana var. stansburiana	Cliff-rose		*l*	
Purshia tridentata	Antelope Bitterbrush	x	y	
Family: Salicaceae	**Willow**			
Populus sargentii	Plains Cottonwood	x	y	
Salix exigua	Coyote Willow/Sandbar Willow	x	y	
Family: Tamaricaceae	**Tamarisk**			
Tamarix pentandra	Tamarisk	x	y	
Family: Ulmaceae	**Elm**			
Ulmus pumila	Chinese Elm/Siberian Elm	x	y	
	Cacti			
Family: Cactaceae	**Cactus**			
Opuntia polyacantha	Plains Prickly Pear	x	y	
Sclerocactus pubispinus	Basin Fishhook Cactus		y	
	Forbs			
Family: Asclepiacaceae	**Milkweed**			
Asclepias speciosa	Showy Milkweed	x	y	
Family: Asteraceae	**Sunflower**			
Ambrosia acanthacarpa	Annual Bursage	x	y	
Antennaria microphylla	Rosy Pussytoes		*l*	
Arctium minus	Common Burdock	x	y	
Balsamorhiza hookeri	Hooker's Balsamroot	x	y	

Table 1-3. Plant Species at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Asteraceae (cont.)	**Sunflower**			
Chaenactis douglasii	Dusty Miller	x	y	
Cirsium arvense	Canada Thistle	x	y	
Cirsium neomexicanum	New Mexican Thistle	x	y	
Cirsium vulgare	Bull Thistle	x	y	
Crepis acuminata	Tapertip Hawksbeard		y	
Crepis occidentalis	American Hawksbeard		y	
Erigeron divergens	Spreading Fleabane	x	y	
Erigeron flagellaris	Trailing Daisy		y	
Grindelia squarrosa var. serrulata	Curlycup Gumweed (Rosinweed)	x	y	
Gutierrezia sarothrae	Broom Snakeweed (Matchweed/Broomweed)	x	y	
Haplopappus acaulis	Stemless Goldenweed		*l*	
Helianthus annuus	Common Sunflower	x	y	
Lactuca scarriola	Prickly Lettuce (China Lettuce)	x	y	
Leucelene ericoides	Heath Aster	x	y	
Lygodesmia grandiflora	Rush Pink	x	y	
Machaeranthera canescens	Purple Aster	x	y	
Salvia dorrii	Desert Sage	x	y	
Senecio spartioides var. multicapitatus	Broom Groundsel	x	y	
Tetradymia canescens	Spineless Horsebrush (Gray Horsebrush)	x	y	
Tragopogon dubius	Western Salsify	x	y	
Tragopogon dubius ssp. major	Goatsbeard/Yellow Salsify	x	y	
Family: Boraginaceae	**Borage**			
Cryptantha humilis	Cryptantha	x	y	
Cryptantha micrantha	Purpleroot	x	y	
Cryptantha compacta	Cryptantha		y	
Cynoglossum officinale	Hound's Tongue		*l*	

Table 1-3. Plant Species at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Brassicaceae	**Mustard**			
Capsella bursa-pastoris	Shepherd's Purse	x	y	
Cardaria draba	Hoary Cress (Whitetop)	x	y	
Camelina microcarpa	Smallseed Falseflax	x	y	
Chorispora tenella	Blue Mustard	x	y	
Conringia orientalis	Hare's Ear Mustard		*l*	
Descurainia pinnata	Pinnate Tansymustard	x	y	
Descurainia sophia	Flixweed	x	y	
Hutchinsia procumbens	Slenderweed		*l*	
Lepidium densiflorum	Prairie Peppergrass		*l*	
Lepidium montanum	Peppergrass	x	y	
Lepidium perfoliatum	Clasping Pepperweed	x	y	
Lesquerella occidentalis	Western Bladderpod		*l*	
Sisymbrium altissimum	Jim Hill Mustard (Tumble Mustard)		*l*	
Sisymbrium officialis	Hedge Mustard	x	y	
Stanleya pinnata	Prince's Plume	x	y	
Thelypodiopsis vermicularis	Thelypody		*l*	
Thelypodium sagittatum	Arrowleaf Thelypody		*l*	
Family: Chenopodiaceae	**Goosefoot**			
Chenopodium album	Common Lambsquarters	x	y	
Eurotia lanata	Winterfat/White Sage	x	y	
Halogeton glomeratus	Halogeton	x	y	
Kochia americana	Green Molly	x	y	
Kochia scoparia	Kochia (Summer-cypress)	x	y	
Salsola iberica	Russian Thistle	x	y	
Salsola pesitfer	Russian Thistle	x	y	
Suaeda occidentalis	Western Seepweed	x	y	
Family: Convolvulaceae	**Morninglory**			
Convolvulus arvensis	Field Bindweed (Creeping Jenny)	x	y	

Table 1-3. Plant Species at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Euphorbiaceae	**Spurge**			
Euphorbia glyptosperma	Ridgeseed Spurge	x	y	
Family: Fabaceae	**Pea**			
Astragalus anserinus	Grove Creek Milkvetch		*l*	
Astragalus beckwithii	Beckwith Milkvetch		*l*	
Astragalus calycosus	Torrey Milkvetch		*l*	
Astragalus cibarius	Browse Milkvetch	x	y	
Astragalus convallarius	Timber Milkvetch		*l*	
Astragalus desereticus	Desert Milkvetch		*l*	
Astragalus lentiginosus	Pohl Milkvetch		*l*	
Astragalus speciosa	Showy Milkvetch		*l*	
Astragalus utahensis	Utah Milkvetch		*l*	
Lathyrus brachycalyx	Shortcalyx Peavine		*l*	
Lupinus brevicaulis	Shortstem Lupine	x	y	
Lupinus caudatus	Spurred Lupine		*l*	
Melilotus alba	White Sweetclover	x	y	
Melilotus officinalis	Yellow Sweetclover	x	y	
Family: Geraniaceae	**Filaree**			
Erodium cicutarium	Redstem Filaree (Storksbill)	x	y	
Family: Hydrophyllaceae	**Phacelia**			
Phacelia argillacea	Clay Phacelia		*l*	E[(d)(e)]
Family: Labiatae	**Catnip**			
Nepeta cataria	Catnip		*l*	
Family: Leguminosae	**Legumes**			
Medicago sativa	Alfalfa	x	y	
Pediomelum lanceolatum	Lemon Scurfpea	x	y	
Psoralea species	Scurfpea	x	y	
Family: Liliaceae	**Lily**			
Allium acuminatum	Pointed Wild Onion	x	y	
Allium nevadense	Onion	x	y	

Table 1-3. Plant Species at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Liliaceae (cont.)	**Lily**			
Calochortus nuttallii	Mariposa Sego Lily	x	y	
Zygadenus paniculatus	Foothill Death Camus	x	y	
Family: Loasaceae	**Blazingstar**			
Acrolasia albicaulis	Acrolasia		*l*	
Mentzelia albicaulis	Whitestem Blazingstar		*l*	
Family: Malvaceae	**Globemallow**			
Sphaeralcea coccinea ssp. dissecta	Scarlet Globemallow	x	y	
Sphaeralcea grossulariaefolia	Gooseberryleaf Globemallow		*l*	
Family: Onagraceae	**Evening Primrose**			
Oenothera caespitosa	Morning Lily		*l*	
Oenothera biennis	Evening Primrose		*l*	
Family: Orchidaceae	**Orchids**			
Spiranthes diluvialis	Ute ladies'-tresses		y	T[(e)(f)]
Family: Polemoniaceae	**Phlox**			
Gilia aggregata	Scarlet Gilia		*l*	
Gilia leptomeria	Gilia	x	y	
Phlox hoodii ssp. canescens	Hood Phlox		*l*	
Phlox longifolia	Longleaf Phlox		*l*	
Family: Polygonaceae	**Buckwheat**			
Eriogonum ovalifolium var.	Wild Buckwheat		*l*	
Eriogonum umbellatum	Sulfur Buckwheat		*l*	
Polygonum aviculare	Prostrate Knotweed	x	y	
Rumex crispus	Curly Dock	x	y	
Family: Ranunculaceae	**Buttercup**			
Ranunculus testiculatus	Bur Buttercup	x	y	
Family: Scrophulariaceae	**Figwort**			
Castilleja chromosa	Paintbrush	x	y	
Penstemon linarioides ssp.	Creeping Penstemon		*l*	
Verbascum thapsus	Common Mullein		*l*	

Table 1-3. Plant Species at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Scrophulariaceae (cont.)	**Figwort**			
Verbascum vergatum	Wand Mullein		*l*	
Veronica biloba	Bilobed Speedwell		*l*	
Family: Typhaceae	**Cattail**			
Typha angustifolia	Narrowleaf Cattail	x	y	
Typha latifolia	Common Cattail	x	y	
Family: Verbenaceae	**Verbena**			
Verbena bracteata	Prostrate Vervain	x	y	
	Graminoids			
Family: Agrostideae	**Redtop**			
Sporobolus cryptandrus	Sand Dropseed	x	y	
Family: Hordeae	**Barley**			
Elymus smithii	Smith's Wild Rye	x	y	
Family: Juncacae	**Rush**			
Juncus arcticus ssp. vallicola	Arctic Rush		y	
Family: Poaceae	**Grass**			
Hordeum jubatum	Foxtail Barley	x	y	
Hordeum leporinum	Hare Barley (Wild Barley)			
Family: Poaceae (Gramineae)	**Grass**			
Aegilops cyclindrica	Jointed Goatgrass	x	y	
Agropyron cristatum ssp. desertorum	Crested Wheatgrass	x	y	
Agropyron elongatum	Tall Wheatgrass	x	y	
Agropyron smithii	Western Wheatgrass, Bluestem	x	*l*	
Agropyron spicatum	Bluebunch Wheatgrass	x	y	
Alopecurus pratensis	Meadow Foxtail	x	y	
Aristida purpurea	Purple Three-awn	x	y	
Bouteloua gracilis	Blue Gramagrass	x	y	
Bromus tectorum	Downy Brome (Cheatgrass)	x	y	
Distichlis stricta	Inland Saltgrass/Desert Saltgrass		*l*	
Elymus cinereus	Basin Wildrye		*l*	

Table 1-3. Plant Species at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Poaceae (Gramineae) (cont.)	**Grass**			
Elymus elongatus	Tall Wheatgrass	x	y	
Hilaria jamesii	Galleta Grass	x	l	
Phragmites communis	Common Reed		l	
Poa bulbosa	Bulbous Bluegrass	x	y	
Poa compressa	Canada Bluegrass		l	
Poa fendleriana	Muttongrass	x	l	
Poa nevadensis	Nevada Bluegrass	x	l	
Poa pratensis	Kentucky Bluegrass	x	l	
Poa secunda/Poa Sandbergii	Sandberg's Bluegrass	x	y	
Puccinellia spp.	Alkaligrass		l	
Secale cereale	Cereal Rye (Common Rye)	x	y	
Sitanion hystrix	Bottlebrush Squirreltail	x	l	
Spartina gracilis	Alkali Cordgrass		l	
Sporobolus airoides	Alkali Sacaton	x	y	
Stipa comata	Needle-and-Threadgrass	x	y	
Stipa hymenoides	Indian Ricegrass	x	y	
Stipa trachycaulum	Slender Wheatgrass	x	y	

Note.—Protection status classification is based on the U.S. Fish & Wildlife Service *Endangered and Threatened Wildlife and Plants* (50 CFR 17.11 & 17.12, October 31, 1996).

[a]Observed.

[b]Yes.

[c]Limited. Habitat exists but will not support carrying capacity populations that would exist in an ideal habitat situation.

[d]Federal Endangered.

[e]Based on discussions with the Salt Lake City U.S. Fish & Wildlife Service office, the only protected plant species listed for Tooele County is *Spiranthes diluvialis*, Ute ladies'-tresses.

[f]Federal Threatened.

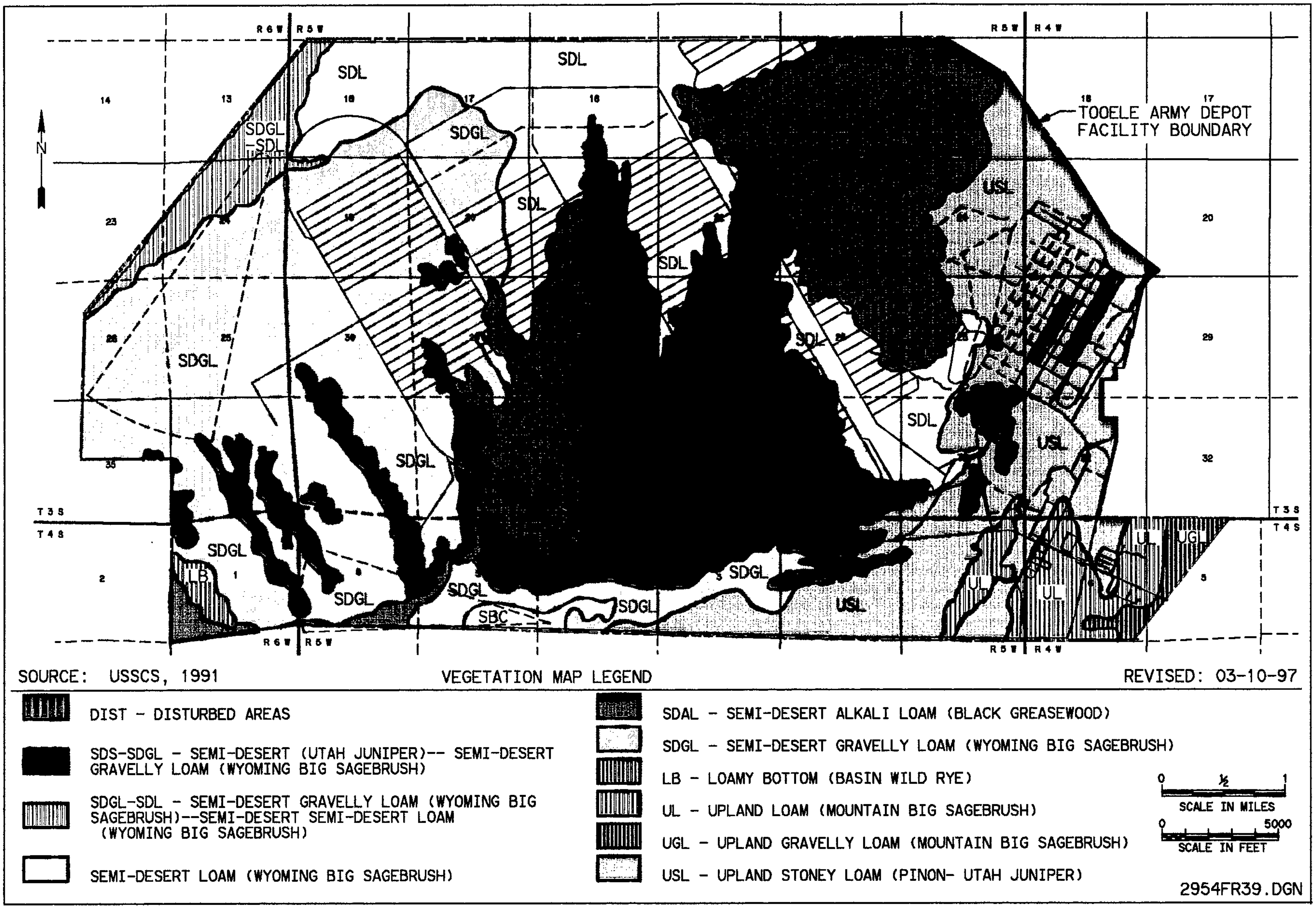

Figure 1-7. Range Site Types at TEAD

Table 1-4. Range Site Types for TEAD

Range Site Type	Soil Type[a]	Acres	Percentage of Total
Semidesert Sand (Utah Juniper)-Semidesert Gravelly Loam (Wyoming Big Sagebrush)	Berent-Hiko Peak Complex	5,070	20
Semidesert Gravelly Loam (Wyoming Big Sagebrush)-Semidesert Loam (Wyoming Big Sagebrush)	Hiko Peak-Taylorsflat Complex	480	2
Semidesert Loam (Wyoming Big Sagebrush)	Taylorsflat, Medburn	3,724	15
Semidesert Gravelly Loam (Wyoming Big Sagebrush)	Hiko Peak	6,350	26
Semidesert Alkali Loam (Black Greasewood)	Manessa, Medburn	3,942	15
Upland Stony Loam (Pinyon-Utah Juniper)	Abela	3,759	15
Loamy Bottom (Basin Wildrye)	Birdow	100	1
Upland Loam (Mountain Big Sagebrush)	Doyce	697	3
(Other)	Borvant, Amtoft, Spager, Duneland, Rock Outcrop, Lakewin, Erda	610	3

[a]For soil type characteristics, see Table 1-2, General Characteristics of TEAD Surface Soil.

Semidesert Loam (Wyoming Big Sagebrush), (3) Semidesert Loam (Wyoming Big Sagebrush), (4) Semidesert Gravelly Loam (Wyoming Big Sagebrush), (5) Semidesert Alkali Loam (Black Greasewood), (6) Upland Stony Loam (Pinyon-Utah Juniper), (7) Loamy Bottom (Basin Wildrye), and (8) Upland Loam (Mountain Big Sagebrush). Each range site type is described below and includes information on the dominant plant species and soils that exist at each site. Refer to Table 1-2 for additional soils information.

1.6.2.1 *Semidesert Sand (Utah Juniper)—Semidesert Gravelly Loam (Wyoming Big Sagebrush)*

This range site type complex occurs on the Berent-Hiko Peak soils type on 2 to 30 percent slopes. The Semidesert Sand range type occurs on the Berent soil; the Semidesert Loam range site type occurs on the Hiko Peak soil. The vegetation that occurs on the Hiko Peak soil is discussed under the Semidesert Gravelly Loam range site type. On the Berent soils, the dominant vegetation is Utah juniper, Wyoming big sagebrush, needle-and-threadgrass, and cheatgrass. The potential plant community on this soil is an overstory of Utah juniper with about 30 percent cover. The understory vegetation is about 45 percent perennials and also

includes Indian ricegrass, fourwing saltbush, sand dropseed, scarlet globemallow, bud sagebrush, and spiny hopsage.

1.6.2.2 *Semidesert Gravelly Loam (Wyoming Big Sagebrush)–Semidesert Loam (Wyoming Big Sagebrush)*

This range site type complex occurs on the soils of the Hiko Peak-Taylorsflat complex on 1 to 15 percent slopes. The vegetation that occurs on the Hiko Peak soil is described under the Semidesert Gravelly Loam (Wyoming Big Sagebrush).

1.6.2.3 *Semidesert Loam (Wyoming Big Sagebrush)*

This range site type occurs on Taylorsflat loam soil type on 1 to 5 percent slopes, and on the Medburn fine sandy loam soils type on 2 to 8 percent slopes. The dominant vegetation in most areas is Wyoming big sagebrush, Indian ricegrass, and cheatgrass. The potential plant community on this range site type is about 50 percent perennial grasses, 15 percent forbs, and 35 percent shrubs. Important plant species include bluebunch wheatgrass, Wyoming big sagebrush, Indian ricegrass, bottlebrush squirreltail, needle-and-threadgrass, scarlet globemallow, penstemon, Hood phlox, and Douglas rabbitbrush.

1.6.2.4 *Semidesert Alkali Loam (Black Greasewood)*

This range site type occurs primarily on the Manessa silt loam soil type on 0 to 3 percent slopes and on the Medburn fine sandy loam saline soils type on 2 to 8 percent slopes. The dominant vegetation is cheatgrass, crested wheatgrass, Wyoming big sagebrush, and bluebunch wheatgrass. The potential plant community on this range site is about 70 percent perennial grasses and 30 percent shrubs. Other important plant species include black greasewood, bottlebrush squirreltail, and Indian ricegrass.

1.6.2.5 *Upland Stony Loam (Pinyon-Utah Juniper)*

This range site type occurs primarily on the Abela gravelly loam soil type on 1 to 8 percent slopes. The dominant vegetation is bluebunch wheatgrass, cheatgrass, mountain big sagebrush, Utah juniper, and yellowbrush. The potential plant community on this range site is an overstory of pinyon and Utah juniper with about 50 percent canopy cover. The understory vegetation is about 45 percent perennial grasses, 5 percent forbs, and 50 percent shrubs. Important plant species also include black sagebrush, bluegrass, and antelope bitterbrush.

1.6.2.6 *Semidesert Gravelly Loam (Wyoming Big Sagebrush)*

This range site type occurs on the Hiko Peak gravelly loam soil type on 2 to 15 percent slopes. The present vegetation is Wyoming big sagebrush, little rabbitbrush, Indian ricegrass, and cheatgrass. The potential plant community is about 45 percent perennial grasses, 15 percent forbs, and 40 percent shrubs. Important plant species include Wyoming big sagebrush, bluebunch wheatgrass, Indian ricegrass, bottlebrush squirreltail, Nevada bluegrass, Hood phlox, rosy pussytoes, and shadscale.

1.6.2.7 *Loamy Bottom (Basin Wildrye)*

This range site type occurs on the Birdow loam soil type on 1 to 4 percent slopes. The dominant vegetation in most areas is basin big sagebrush, bluebunch wheatgrass, rubber rabbitbrush, and basin wildrye. The potential plant community is about 70 percent perennial grasses, 10 percent forbs, and 20 percent shrubs. Important plant species are basin wildrye, basin big sagebrush, western wheatgrass, Nevada bluegrass, tapertip hawksbeard, and rubber rabbitbrush.

1.6.2.8 *Upland Loam (Mountain Big Sagebrush)*

This range site type occurs on the Doyce loam soil type on 2 to 8 percent slopes. The dominant vegetation in most areas is mountain big sagebrush, rabbitbrush, bluebunch wheatgrass, antelope bitterbrush, and some Utah juniper. The potential plant community is about 60 percent perennial grasses, 10 percent forbs, and 30 percent shrubs. Important plant species also include Indian ricegrass and bluegrass.

1.6.2.9 *Disturbed Areas*

This mapping unit includes a variety of soil and vegetation types, which reflect disturbances resulting from human activities. This mapping unit includes the Borrow Pits soil mapping units, as well as other areas of the facility that have been disturbed. Much of this soil type supports less than 10 percent vegetative cover and has no agricultural value. Some of the Borrow Pit areas, however, may have some value for wildlife habitat or industrial use. Floral composition varies, but species generally include cheatgrass, Indian ricegrass, and rabbitbrush.

1.6.3 Domestic Livestock Grazing Practices

Livestock has grazed in the Utah Great Basin and Tooele Valley since approximately 1850. This practice has altered plant communities throughout the area, including those at the TEAD site. Past and present grazing activities contribute to the existing vegetational and distribution patterns observed at TEAD. The short growing season that exists between the cold spring and

hot summer has only allowed a minimum of forage species to grow. During the winter months, cattle are dependent on dry, coarse forage, which is often deficient in digestible protein. When the green shoots of forage plants appear in the spring, the cattle feed on them immediately. This intensive early spring grazing has tended to inhibit the flowering and seed production capabilities of many native perennial plant species, leading to their eradication. In addition, sagebrush and rabbitbrush communities have prospered because these shrubs flower in the fall and, in general, are not grazed extensively by cattle.

Cattle grazing is currently permitted at TEAD, with grazing allotments competitively bid and leased every 5 years to a single rancher. Grazing typically occurs between October 15 and May 31, with calving taking place in January. The current lease allows approximately 1,000 head of cattle at TEAD.

In the big sagebrush communities of the Great Basin, there exists a balance between the herbaceous and woody vegetation species. In studies done with crested wheatgrass, an herbaceous perennial, it was discovered that for every 1 percent increase in the cover of big sagebrush, there was a corresponding 10 percent reduction in the production of crested wheatgrass. This change in relative amounts of big sagebrush as compared to grasses may be due to both the spring grazing factor and to the tendency of sagebrush to secrete chemicals into the soil that can control the abundance, distribution, and spatial associations that exist between species. Reduction in the herbaceous cover with a resultant increase in the density of dominant shrubs may enhance the introduction of non-native plant species, such as Russian thistle and cheatgrass. A major ecological concern in the case of non-native annual species is their dominance in disturbed areas (e.g., areas that are overgrazed or subject to excessive vehicle usage), which may alter the frequency and timing of wildfires. Cheatgrass dominance tends to close existing plant communities to the re-establishment of native perennial grasses because the cheatgrass forms an extensive "mat" of groundcover, completely filling in the space between shrubs. If the cheatgrass community is itself altered due to overgrazing, Jim Hill mustard (*Sisymbrium altissimum*) will take its place. If overgrazing continues, this in turn will lead to dominance by Russian thistle. Minimal disturbance to an already overgrazed area with a dominant community consisting of cheatgrass will perpetuate this species of grass. The widespread prevalence of cheatgrass, and general scarcity of other native grasses, coupled with human disturbance and over grazing, likely results in an ecological monoculture which is typically reflected in a reduction of the diversity of wildlife species.

Many nongrazing animals use cheatgrass for the collection and caching of seeds for food, further aiding in the spread and regeneration of this species. Although not likely at TEAD because of the high level of human occupation, accumulations of ungrazed cheatgrass can lead to an increased frequency and geographic extent of wildfires (Harper et. al., 1994). Because cheatgrass does not grow in clumps, as the native grasses do, these cheatgrass-invaded communities provide the ideal substrate for wildfires that burn not only the grasses but also from shrub to shrub. This keeps the woody plant development in check, which allows the cheatgrass to further expand its hold on the rangeland. This process also promotes the regeneration of perennial species with long persistent root networks. These cheatgrass fires

create an ideal situation for the perpetuation of cheatgrass, setting up a condition for the site to burn time after time, a future possibility as TEAD work begins to phase down.

1.6.4 Regional Wildlife

The wildlife in the Great Basin desert system, and in the Tooele Region in particular, have adapted to these environmental factors by specializing as hibernators, estivators (i.e., summer hibernators), and diurnal or nocturnal species. The region is inhabited by a wide variety of animal species (invertebrates, amphibians/reptiles, birds, and mammals), which occur as either permanent, temporary, or seasonal residents, or on a migratory basis.

Invertebrates such as grasshoppers, beetles, butterflies and moths, ants, spiders, and the Mormon cricket all exist in this area. Outbreaks of Mormon crickets, along with the pallid-winged and speckled rangeland grasshoppers, are not uncommon.

While few amphibian species exist in the Great Basin, mainly because of limited water sources, the presence of reptiles is common. The Great Basin spadefoot toad can be supported by the temporary bodies of water that do exist here, along with occasional salamanders. Snakes and lizards are common throughout this area.

Raptors (eagles, hawks, falcons, and owls) exist in the area. This is due primarily to the abundance of small mammals for predation. The other bird species are somewhat limited in lower elevations because of the low-lying vegetation types and a limited supply of consumable seeds. Once the transition is made to the pinyon-juniper forests, the numbers and varieties of bird species increase. Only a few bird species, such as the sage grouse and the sage sparrow, favor the sagebrush communities, and these species are not readily observed.

Most of the desert mammals are nocturnal. Coyote populations follow the cyclical nature of the jackrabbit population, which reach peak densities every 9 to 11 years (Armstrong 1982). When the jackrabbit populations are low, the coyotes eat the small rodents, which are plentiful most of the time. The pronghorn antelope and the mule deer also inhabit most Great Basin communities.

1.6.5 Site-Specific Wildlife

Ecological investigations, as discussed in Section 3, were conducted by Rust E&I during the summer and fall of 1994 at the TEAD facility. These investigations included qualitative vegetation, mammal, bird, and threatened and endangered species surveys for those SWMUs identified for inclusion in the SWERA and for those SWMUs where ecological habitat was present. These surveys also included the recording of incidental observations, such as signs of amphibians and reptiles. Quantitative vegetation and wildlife surveys including trap and release studies, vegetation and jackrabbit sampling, and collection of grasshoppers and beetles, were also conducted for selected SWMUs.

As a result of these investigations plus observations made by other contractors as reported in other TEAD documents, a total of 127 species have been identified in and near the vicinity of TEAD or have potential habitat at TEAD. Of these, 58 species were mammals, 63 were birds, and 6 were reptiles. No fish or amphibians have been identified at the facility. Table 1-5 lists the observed or potential wildlife species for the TEAD area. Included in this master list were species that, while not physically observed, utilize habitats that exist at TEAD and could possibly be present at this facility. Appendix A of this report presents biological profiles describing general life history information of key species for the TEAD site.

As discussed in Section 2.2.3, this information was used as a master list of wildlife species for selection of representative species, also considering all potential exposure pathways.

1.6.6 Threatened and Endangered Species

A limited survey for threatened and endangered plant species was conducted June 21, 1993, at TEAD by Dr. Stanley Welsh (Endangered Plant Studies, Inc. 1993). Dr. Welsh, professor at Brigham Young University, is a recognized desert plant botanist and has authored books on Utah vegetation. No threatened or endangered species were found during the survey, which may have been due, in part, to the fact that not all of TEAD was surveyed and that the survey took place during only a single season. Table 1-6 lists the Federal threatened, endangered, or candidate species, and the State of Utah sensitive plant and faunal wildlife species either known to occur or that potentially may occur at TEAD. Many of the species formerly listed as Special Status in earlier versions of the SWERA are no longer listed either under Federal or State of Utah regulations (e.g., kit fox, Western bluebird, cryptantha compacta). Habitat information is included for those species not observed at TEAD to help identify where they could possibly be found. Data from all other TEAD contractors as well as available data from the USFWS and the State of Utah were examined in the preparation of the table.

Table 1-5. Observed and Potential Wildlife at TEAD

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
	Phylum: Arthropoda			
	Class: Insecta			
Order: Orthoptera				
Family: Acrididae	Short-horned Grasshoppers	x[a]	1[b]	
Subfamily: Oedipodinae	Band-winged Grasshoppers	x	1	
Subfamily: Cyracanthacridinae	Spur-throated Grasshoppers	x	1	
Suborder: Ensifera				
Family: Tettigoniidae	Long-horned Grasshoppers & Katydids			
Anabrus simplex	Mormon cricket	x	1	
Subfamily: Conocephalinae	Meadow Grasshoppers	x	1	
Family: Gryllacrididae	Camel Crickets			
Subfamily: Stenopelmatinae	Jerusalem cricket	x	1	
Suborder: Mantodea				
Family: Mantidea	Praying Mantids	x	1	
Order: Coleoptera				
Suborder: Adephaga				
Family: Carabidae	Ground Beetles	x	1	
Suborder: Polyphaga				
Family: Silphidae	Carrion Beetles	x	1	
	Phylum: Chordata			
	Class: Amphibia (Amphibians)			
Order: Anura				
Family: Bufonidae	**True Toads**			
Bufo cognatus	Great Plains toad		2[c]	
Bufo woodhousei	Western woodhouse toad		2	
Family: Pelobatidae	**Spadefoot**			
Scaphiopus intermontanus	Great Basin spadefoot		1	
Family: Hylidae	**Tree frogs**			
Pseudacris triseriata	Striped chorus frog		2	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Ranidae	**Ranids**			
Rana pipiens	Northern leopard frog		2	
	Class: Reptilia (Reptiles)			
Order: Squamata	**Lizards and Snakes**			
Suborder: Sauria	**Lizards**			
Family: Iguanidae	**Iguanids**			
Crotaphytus collaris	Collared lizard		2	
Gambelia wislizenii	Long-nosed leopard lizard	x	1	
Phrynosoma platyrhinos	Desert horned lizard	x	1	
Phrynosoma douglassi	Short-horned lizard		2	
Sceloporus graciosus	Sagebrush lizard	x	1	
Uta stansburiana	Side-blotched lizard	x	1	
Family: Scincidae	**Skinks**			
Eumeces skiltonianus	Western skink		1	
Family: Teiidae	**Whiptails and Race-runners**			
Cnemidophorus tigris	Western whiptail		1	
Suborder: Serpentes	**Snakes**			
Family: Colubridae	**Colubrids**			
Coluber constrictor	Western yellow-bellied racer		1	
Hypsiglena torquata	Night snake		1	
Masticophis taeniatus	Striped whipsnake		1	
Pituophis melanoleucus deserticola	Great Basin gopher snake	x	1	
Pituophis melanoleucus sayi	Bullsnake	x	1	
Thamnophis elegans vagrans	Wandering garter snake		2	
Family: Viperidae	**Vipers**			
Crotalus viridis lotosus	Great Basin rattlesnake	x	1	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
	Class: Aves (Birds)			
Order: Anseriformes	**Waterfowl**			
Family: Anatidae	**Geese and Ducks**			
Anas acuta	Northern pintail	x	2	
Anas americana	American wigeon		2	
Anas clypeata	Northern shoveler		2	
Anas crecca	Green-winged teal	x	2	
Anas cyanoptera	Cinnamon teal	x	2	
Anas discors	Blue-winged teal	x	2	
Anas platyrhynchos	Mallard duck	x	2	
Anas strepera	Gadwall	x	2	
Aythya affinis	Lesser scaup	x	2	
Aythya americana	Redhead		2	
Branta canadensis	Canada goose	x	2	
Bucephala albeola	Bufflehead		2	
Mergus merganser	Common merganser		2	
Oxyura jamaicensis	Ruddy duck		2	
Order: Apodiformes	**Swifts and Hummingbirds**			
Family: Apodidae	**Swifts**			
Aeronautes saxatilis	White-throated swift	x	2	
Family: Trochilidae	**Hummingbirds**			
Archilochus alexandri	Black-chinned hummingbird		1	
Selasphorus platycercus	Broad-tailed hummingbird	x	2	
Selasphorus rufus	Rufous hummingbird		2	
Order: Caprimulgiformes	**Goatsuckers**			
Family: Caprimulgidae	**Nightjars**			
Chordeiles minor	Common nighthawk	x	1	
Phalaenoptilus nuttallii	Common poorwill		1	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Order: Charadriiformes	**Shorebirds**			
Family: Charadriidae	**Plovers**			
Charadrius alexandrinus	Snowy plover		2	
Charadrius montanus	Mountain plover	x	1	USS[d], FCS[e]
Charadrius vociferus	Killdeer	x	1	
Family: Laridae	**Gulls**			
Larus californicus	California gull	x	1	
Larus delawarensis	Ring-billed gull		2	
Larus pipixcan	Franklin's gull		1	
Family: Recurvirostridae	**Avocets**			
Recurvirostra americana	American acovet	x	2	
Family: Scolopacidae	**Sandpipers and Phalaropes**			
Gallinago gallinago	Common snipe		2	
Numenius americanus	Long-billed curlew		2	USS
Order: Ciconiformes	**Herons and Storks**			
Family: Ardeidae	**Herons and Bitterns**			
Ardea herodias	Great blue heron		2	
Nycticorax nycticorax	Black-crowned night heron		2	
Family: Threskiornithidae	**Ibises**			
Plegadis chihi	White-faced ibis		2	FCS
Order: Columbiformes	**Pigeons**			
Family: Columbidae	**Pigeons and Doves**			
Columba livia	Rock dove	x	1	
Zenaida macroura	Mourning dove	x	1	
Order: Falconiformes	**Birds of Prey**			
Family: Accipitridae	**Hawks and Eagles**			
Accipiter cooperi	Cooper's hawk	x	2	
Accipiter gentilis	Northern goshawk		2	USS
Accipiter striatus	Sharp-shinned hawk		2	
Aquila chrysaetos	Golden eagle	x	1	EP[f]
Buteo jamaicensis	Red-tailed hawk	x	1	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Accipitridae (cont.)	**Hawks and Eagles**			
Buteo lagopus	Rough-legged hawk	x	2	
Buteo regalis	Ferruginous hawk	x	1	UTS[g]
Buteo swainsoni	Swainson's hawk	x	1	USS
Circus cyaneus	Marsh hawk (Northern harrier)	x	1	
Haliaeetus leucocephalus	Bald eagle	x	2	UTS,FT[h]
Subfamily: Pandionidae	**Ospreys**			
Pandion haliaetus	Osprey	x	2	USS
Family: Cathartidae	**Vultures**			
Cathartes aura	Turkey vulture	x	1	
Family: Falconidae	**Falcons**			
Falco columbarius	Merlin		1	
Falco mexicanus	Prairie falcon	x	1	
Falco peregrinus	Peregrine falcon		2	UES[i],FE[j]
Falco sparverius	American kestrel	x	1	
Order: Galliformes	**Gallinaceous Birds**			
Family: Phasianidae	**Fowl-like birds**			
Alectoris chukar	Chukar		1	
Centrocercus urophasianus	Sage grouse	x	1	
Phasianus colchicus	Ring-necked pheasant		2	
Order: Passeriformes	**Perching Birds (Passerines)**			
Family: Aegithalidae	**Bushtit**			
Psaltriparus minimus	Bushtit	x	1	
Family: Alaudidae	**Larks**			
Eremophila alpestris	Horned lark	x	1	
Family: Bombycillidae	**Waxwings**			
Bombycilla cedrorum	Cedar waxwing		1	
Bombycilla garrulus	Bohemian waxwing		1	
Family: Certhiidae	**Creepers**			
Certhia americana	Brown creeper		2	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Corvidae	**Jays, magpies, and crows**			
Aphelocoma coerulescens	Scrub jay		1	
Corvus brachyrhynchos	American crow	x	1	
Corvus corax	Common raven	x	1	
Cyanocitta stelleri	Steller's jay		1	
Gymnorhinus cyanocephalus	Pinon jay	x	1	
Pica pica	Black-billed magpie	x	1	
Family: Emberizidae	**Grosbeaks and sparrows**			
Amphispiza belli	Sage sparrow	x	1	
Amphispiza bilineata	Black-throated sparrow		1	
Chondestes grammacus	Lark sparrow	x	1	
Melospiza melodia	Song sparrow	x	1	
Passerculus sandwichensis	Savannah sparrow	x	2	
Passerella iliaca	Fox sparrow	x	1	
Passernina amoena	Lazuli bunting	x	1	
Pheucticus melanocephalus	Black-headed grosbeak	x	2	
Pipilo chlorurus	Green-tailed towhee	x	2	
Pipilo erythrophthalmus	Rufous-sided towhee		2	
Pooecetes gramineus	Vesper sparrow	x	1	
Spizella arborea	American tree sparrow		1	
Spizella breweri	Brewer's sparrow		1	
Spizella passerina	Chipping sparrow	x	1	
Zonotrichia leucophrys	White-crowned sparrow		1	
Subfamily: Icteridae	**Blackbirds and orioles**			
Agelaius phoeniceus	Red-winged blackbird	x	1	
Euphagus cyanocephalus	Brewer's blackbird	x	1	
Molothrus ater	Brown-headed cowbird	x	1	
Sturnella neglecta	Western meadowlark	x	1	
Xanthocephalus xanthocephalus	Yellow-headed blackbird	x	2	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Subfamily: Parulinae	**Wood warbler**			
Dendroica coronata	Yellow-rumped warbler	x	2	
Dendroica nigrescens	Black-throated gray warbler		2	
Dendroica petechia	Yellow warbler	x	2	
Geothlypis trichas	Common yellowthroat	x	1	USS
Icteria virens	Yellow-breasted chat	x	2	USS
Oporornis tolmiei	MacGillivray's warbler	x	2	
Vermivora celata	Orange-crowned warbler		2	
Vermivora virginiae	Virginia's warbler		1	
Subfamily: Thraupinae	**Tanagers**			
Piranga ludoviciana	Western tanager		2	
Family: Fringillidae	**Finches**			
Carduelis pinus	Pine siskin	x	2	
Carduelis tristis	American goldfinch		2	
Carpodacus cassinii	Cassin's finch		1	
Carpodacus mexicanus	House finch		1	
Coccothraustes vespertinus	Evening grosbeak		2	
Leucosticte arctoa	Rosy finch		2	
Loxia curvirostra	Red crossbill		2	
Family: Hirundinidae	**Swallows**			
Hirundo pyrrhonota	Cliff swallow		2	
Hirundo rustica	Barn swallow	x	2	
Stelgidopteryx serripennis	Northern rough-winged swallow	x	2	
Tachycineta bicolor	Tree swallow		2	
Tachycineta thalassina	Violet-green swallow		2	
Family: Laniidae	**Shrikes**			
Lanius excubitor	Northern shrike		1	
Lanius ludovicianus	Loggerhead shrike	x	1	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Mimidae	**Mockingbirds and Thrashers**			
Mimus polyglottos	Northern mockingbird		1	
Oreoscoptes montanus	Sage thrasher		1	
Family: Paridae	**Chickadees and titmice**			
Parus atricapillus	Black-capped chickadee	x	2	
Family: Passeridae	**Old World Sparrows**			
Passer domesticus	House sparrow	x	1	
Family: Sittidae	**Nuthatches**			
Sitta canadensis	Red-breasted nuthatch		2	
Sitta carolinensis	White-breasted nuthatch		2	
Family: Sturnidae	**Starlings**			
Sturnus vulgaris	European starling	x	1	
Family: Troglodytidae	**Wrens**			
Catherpes mexicanus	Canyon wren		1	
Cistothorus palustris	Marsh wren		2	
Salpinctes obsoletus	Rock wren	x	1	
Troglodytes aedon	House wren	x	1	
Troglodytes troglodytes	Winter wren		2	
Family: Muscicapidae	**Thrushes, solitaires, bluebirds,**			
Catharus guttatus	Hermit thrush		1	
Myadestes townsendi	Townsend's solitaire		1	
Polioptila caerulea	Blue-gray gnatcatcher		1	
Regulus calendula	Ruby-crowned kinglet	x	2	
Regulus satrapa	Golden-crowned kinglet	x	2	
Sialia currucoides	Mountain bluebird	x	2	
Sialia mexicana	Western bluebird	x	2	
Turdus migratorius	American robin	x	1	
Family: Tyrannidae	**Flycatchers**			
Contopus borealis	Olive-sided flycatcher		2	
Contopus sordidulus	Western wood-pewee	x	2	
Empidonax difficilis	Western flycatcher		2	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Tyrannidae (cont.)	**Flycatchers**			
Empidonax hammondii	Hammond's flycatcher		2	
Empidonax oberholseri	Dusky flycatcher		2	
Empidonax traillii	Willow flycatcher		2	UES,FE
Myiarchus cinerascens	Ash-throated flycatcher		1	
Sayornis saya	Say's phoebe		1	
Tyrannus verticalis	Western kingbird	x	1	
Family: Vireonidae	**Vireos**			
Vireo gilvus	Warbling vireo		2	
Vireo solitarius	Solitary vireo		2	
Order: Piciformes	**Woodpeckers**			
Family: Picidae	**Woodpeckers**			
Colaptes auratus	Northern flicker (red shafted, yellow)	x	1	
Picoides pubescens	Downy woodpecker	x	2	
Picoides villosus	Hairy woodpecker	x	1	
Sphyrapicus nuchalis	Red-naped sapsucker		2	
Order: Strigiformes				
Family: Strigidae	**Owls**			
Asio flammeus	Short-eared owl		1	USS
Asio otus	Long-eared owl		2	
Athene cunicularia	Burrowing owl		1	USS
Bubo virginianus	Great horned owl	x	1	
Otus kennicotti	Western screech-owl	x	1	
Family: Tytonidae				
Tyto alba	Barn owl	x	1	
	Class: Mammalia (Mammals)			
Order: Artiodactyla	**Even-toed Ungulates**			
Family: Antilocapridae	**Pronghorn**			
Antilocapra americana	Pronghorn	x	1	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Cervidae	**Deer**			
Cervus canadensis	Elk		2	
Odocoileus hemionus	Mule deer	x	1	
Order: Carnivora	**Carnivores**			
Family: Canidae	**Wolves, Foxes, and the Coyote**			
Canis latrans	Coyote	x	1	
Vulpes fulva	Red fox	x	1	
Vulpes macrotis	Kit fox		1	
Family: Felidae	**Cats**			
Felis concolor	Mountain lion		2	
Lynx rufus	Bobcat		1	
Family: Mustelidae	**Weasels, Skunks, and Badgers**			
Mephitis mephitis	Striped skunk	x	1	
Mustela erminea	Short-tailed weasel		1	
Mustela frenata	Long-tailed weasel		2	
Mustela vison	Mink		2	
Taxidea taxus	Badger	x	1	
Family: Procyonidae	**Ringtails**			
Bassariscus astutus	Ringtail		2	USS
Order: Chiroptera	**Bats**			
Family: Molossidae	**Free-tailed Bats**			
Tadarida brasiliensis	Mexican free-tailed bat		2	USS
Family: Vespertilionidae	**Plainnose bats**			
Eptesicus fuscus	Big brown bat	x	1	
Euderma maculata	Spotted bat		1	USS
Lasionycteris noctivagans	Silver-haired bat	x	1	
Lasiurus cinereus	Hoary bat		1	
Myotis californicus	California myotis	x	1	
Myotis evotis	Long-eared myotis		2	
Myotis lucifugus	Little brown myotis		1	
Myotis subulatus	Small-footed myotis		1	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Vespertilionidae (cont.)	**Plainnose bats**			
Myotis thysanodes	Fringed myotis		1	USS
Myotis velifer	Cave myotis		1	
Myotis volans	Long-legged myotis		1	
Pipistrellus hesperus	Western pipistrel		1	
Order: Insectivora	**Insectivores**			
Family: Soricidae	**Shrews**			
Sorex merriami	Merriam's shrew	x	1	
Sorex obscurus	Dusky shrew	x	2	
Sorex vagrans	Vagrant shrew	x	2	
Order: Lagomorpha	**Lagomorphs**			
Family: Leporidae	**Rabbits and Hares**			
Lepus californicus	Black-tailed jackrabbit	x	1	
Lepus townsendi	Whitetail jackrabbit		2	
Sylvilagus auduboni	Desert cottontail	x	1	
Sylvilagus idahoensis	Pygmy rabbit		2	
Sylvilagus nuttalli	Mountain cottontail		1	
Order: Rodentia	**Rodents**			
Family: Muridae	**Mice, rats, lemmings, and voles**			
Clethrionomys gapperi	Boreal redback vole	x	2	
Lagurus curtatus	Sagebrush vole	x	1	
Microtus longicaudus	Longtail vole	x	1	
Microtus montanus	Mountain vole	x	2	
Microtus pennsylvanicus	Meadow vole	x	2	
Mus musculus	House mouse	x	1	
Neotoma cinerea	Bushytail woodrat		2	
Neotoma lepida	Desert woodrat		1	
Onychomys leucogaster	Northern grasshopper mouse		1	
Peromyscus boylii	Brush mouse	x	1	
Peromyscus crinitus	Canyon mouse		2	
Peromyscus maniculatus	Deer mouse	x	1	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Muridae (cont.)	**Mice, rats, lemmings, and voles**			
Peromyscus truei	Pinon mouse	x	1	
Phenacomys intermedius	Heather vole	x	1	
Rattus norvegicus	Norway rat		1	
Reithrodontomys megalotis	Western harvest mouse	x	1	
Family: Erethizontidae	Porcupines			
Erethizon dorsatum	Porcupine	x	1	
Family: Geomyidae	**Pocket gophers**			
Thomomys bottae	Valley pocket gopher	x	1	
Thomomys talpoides	Northern pocket gopher	x	2	
Family: Heteromyidae	**Pocket mice and Kangaroo rats**			
Dipodomys microps	Great Basin kangaroo rat	x	1	
Dipodomys ordii	Ord's kangaroo rat	x	2	
Microdipodops megacephalus	Dark kangaroo mouse	x	1	
Perognathus fasciatus	Wyoming pocket mouse		1	USS
Perognathus longimembris	Little pocket mouse	x	1	
Perognathus parvus	Great Basin pocket mouse	x	1	
Family: Dipodidae	**Jumping mice**			
Zapus princeps	Western jumping mouse	x	2	

Table 1-5. Observed and Potential Wildlife at TEAD (continued)

Scientific Name	Common Name	Observed	Appropriate Habitat	Special Status Species
Family: Sciuridae	**Squirrels**			
Ammospermophilus leucurus	Whitetail antelope squirrel	x	1	
Citellus townsendii	Townsend's ground squirrel	x	1	
Citellus variegatus	Rock squirrel	x	1	
Eutamias dorsalis	Cliff chipmunk	x	1	
Eutamias minimus	Least chipmunk	x	1	
Eutamias umbrinus	Uinta chipmunk	x	1	
Marmota flaviventris	Yellow-bellied marmot		2	
Tamiasciurus hudsonicus	Red squirrel		1	

Note.—Protection status classification is based on the *Utah Sensitive Species List* prepared by the Utah Division of Wildlife Resources (March 1997) and *Endangered and Threatened Wildlife and Plants* prepared by the U.S. Fish & Wildlife Service (October 31, 1996).

[a]Observed.
[b]1: Habitat exists to support large population.
[c]2: Limited. Habitat exists but will not support capacity populations that would exist in an ideal habitat situation.
[d]Utah State Sensitive species.
[e]Federal Candidate Species
[f]Protected under Eagle Protection Act.
[g]Utah Threatened Species.
[h]Federal Threatened Species.
[i]Utah Endangered Species.
[j]Federal Endangered Species.

Primary reference for vertebrates: *Checklist of Vertebrates of the United States, the U.S. Territories, and Canada*; edited by Richard Banks, Roy W. Diarmid, and Alfred L. Gardner; U.S. Department of the Interior, Fish and Wildlife Service Resource Publication 166, Washington, D.C., 1987.

Table 1-6. Special Status Species Applicable to TEAD

	Scientific Name	Common Name	Confirmed or Possible TEAD SWMU Location
Flora	*Phacelia argillacea*	Clay phacelia	Federal Endangered species. Has not been found at TEAD. Not listed as sensitive species for Tooele County; narrowly adapted to clay soil on slopes of Green River Shale Formation. As a result, not likely to be found at any TEAD SWMU.
	Spiranthes diluvialis	Ute ladies'-tresses	Federal Threatened Species. Although not observed at TEAD, according to the Salt Lake City USFWS, it is the only Federal Endangered or Threatened plant species listed as occurring in Tooele County.
Fauna			
Birds of Prey	*Haliaeetus leucocephalus*	Bald eagle	Utah and Federal Threatened species. Has been observed at TEAD, specifically noted at SWMU 14.
	Aquila chrysaetos	Golden eagle	Protected under Eagle Protection Act. Has been observed at all TEAD SWMUs as well as at the edge of the maintenance area and the nearby RSA.
	Falco peregrinus	American peregrine falcon	Utah and Federal Endangered species. Has not been observed at TEAD.
	Buteo swainsoni	Swainson's hawk	Utah Sensitive species. Has been observed at SWMUs 1b/1c, 10/11 and 21/37.
	Buteo regalis	Ferruginous hawk	Utah Threatened species. Has been observed at SWMUs 10/11 and 21/37.
	Accipiter gentilis	Northern goshawk	Utah Sensitive species. Has not been observed at TEAD.
	Pandion haligetus	Osprey	Utah Sensitive species. Has been observed in the sewage lagoon area of TEAD.
	Athene cunicularia	Burrowing owl	Utah Sensitive species. Has not been observed at TEAD.
	Asio flammeus	Short-eared owl	Utah Sensitive species. Has not been observed at TEAD.

Table 1-6. Special Status Species Applicable to TEAD (continued)

	Scientific Name	Common Name	Confirmed or Possible TEAD SWMU Location
Shorebirds and Waterfowl	*Charadrius montanus*	Mountain plover	Utah Sensitive species and Federal Candidate species. Has been observed near the Sewage Lagoons, SWMU 14.
	Numenius americanus	Long-billed curlew	Utah Sensitive species. Has not been observed at TEAD.
	Plegadischihi chihi	White-faced ibis	Federal Candidate species. Has not been observed at TEAD.
Passerine (Perching) Birds	*Geothlypis trichas*	Common yellowthroat	Utah Sensitive species. Observed once at TEAD at an undocumented location. A migrant, it nests is wetlands and riparian areas.
	Icteria virens	Yellow-breasted chat	Utah Sensitive species. There have been undocumented reports of occasional sightings of this species at TEAD. This migratory species nests in riparian settings.
	Empidonax trailii	Willow flycatcher	Utah and Federal Endangered species. Not observed at TEAD. Habitat is willow or alder thickets along streams or bogs.
Small Herbivore	*Perognathus fasciatus*	Wyoming pocket mouse	Utah Sensitive species. Has not been observed at TEAD.
Omnivore/ Carnivore	*Euderma maculata*	Spotted bat	Utah Sensitive species. Has not been observed at TEAD.
	Tadarida brasiliensis	Mexican free-tail bat	Utah Sensitive species. Has not been observed at TEAD.
	Myotis thysanodes	Fringed myotis	Utah Sensitive species. Has not been observed at TEAD.
	Bassariscus astutus	Ringtail	Utah Sensitive species. Has not been observed at TEAD.

2.0 APPROACH AND METHODOLOGY

2.1 FRAMEWORK AND OBJECTIVES

Two primary objectives of this SWERA are regulatory compliance and completion of a comprehensive ecological risk assessment designed to identify and characterize any adverse effects of TEAD contaminants on the ecosystems and biotic communities that exist at the facility. The results of the assessment are used to provide risk managers with an understanding of the actual and potential risks to ecological health and any associated uncertainties. This information can then be used to help determine the need for remedial action.

A baseline ecological risk assessment evaluates potential threats to the environment in the absence of any remedial actions (i.e., the no-action alternative). The no-action alternative (NAA) assumes no corrective actions will take place and no restrictions will be placed on future uses of the area. Evaluation of this NAA is required under 40 CFR Part 300 Section 300.430(d) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This SWERA is site-specific and, where applicable and appropriate, quantitative evaluations of exposure and risk were conducted by following the most current and applicable regulatory guidance. The guidance utilized for this SWERA includes, but is not limited to, the following documents:

- *Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part A*. Interim Final. December 1989 (USEPA 1989b).

- *Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual.* March 1989 (USEPA 1989a).

- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors"*. Interim Final. March 1991 (USEPA 1991a).

- USEPA Region VI *Guidance on Central Tendency and RME Exposure Parameters*. 1992 (USEPA 1992b).

- *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.* Interim Final. October 1988 (USEPA 1988a).

- *Guidance for Data Useability in Risk Assessment - Part A*. USEPA Directive 9285.7-09A, April 1992 (USEPA 1992c).

- *Framework for Ecological Risk Assessment.* February 1992 (USEPA 1992d).

- *Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference Document.* USEPA 600/3-89/013. March 1989 (USEPA 1989c).

- *Wildlife Exposure Factors Handbook (Volumes I and II).* USEPA/600/R-93/187a and b (USEPA 1993a).

The SWERA addresses the requirements of both CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), and RCRA. An environmental evaluation at TEAD is specifically required by Sections 121(b)(1) and (d) of CERCLA and by the Utah Hazardous Waste Post-Closure Permit for TEAD issued January 7, 1991. CERCLA requires that remedial actions be protective of the environment and follow the guidance provided in the NCP and other USEPA documents. The State of Utah Solid and Hazardous Waste Control Board's *Corrective Action Clean-up Standards Policy for RCRA, UST and CERCLA Sites/Cleanup Action and Risk-Based Closure Standards* (Utah Administrative Code, R315-101, January 1994) also address the requirements for conducting an ecological study.

The framework for the SWERA, which began in late 1993 during the work plan phase, was based on a combination of two USEPA guidance documents available at the time (USEPA/630/R-92/001: *Framework for Ecological Risk Assessment* (USEPA 1992d) and USEPA QA/G-4: *Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objectives Process* (USEPA 1993b)). The seven steps for developing Data Quality Objectives (DQOs) (refer to Section 2.1.3) were incorporated into the problem-formulation and analysis phases from the *Framework for Ecological Risk Assessment* document. Since that time, the USEPA has published recent guidance for conducting ecological risk assessments, (e.g., *Proposed Guidelines for Ecological Risk Assessment*; Federal Register, FRL-5605-9, 9/9/96, and *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final*, 6/5/97). The majority of key elements in the newer guidance documents have been incorporated in the TEAD SWERA. One such component in the newer guidance is the "8-Step Ecological Risk Assessment Process for Superfund" which includes scientific management decision points (SMDPs). These SMDPs chart agreement on key decisions (e.g., selection of endpoints and receptors, conceptual site models, food web models, etc.) and govern the direction in the ERA process. Although not addressed as SMDPs per se in this document, the substance of such elements was achieved in this SWERA through the input and consensus of the ETAG.

In order to develop an approach to the SWERA at TEAD, three distinct and separate phases were included. This phased approach resembles the retrospective ecological risk assessment described by Suter (1993). Figure 2-1 illustrates the three phases of the SWERA model.

Phase I involved the definition of the hazard or contaminant source on the basis of existing information and focused on the formulation of the problem. Phase II entailed the collection of data used for the measurement and estimation of exposure and effects. Phase III consisted of risk characterization and focused on the probability and magnitude of current and future adverse effects on ecological receptors.

The data inputs from Phase I of the SWERA provided the basis for subsequent data analysis and decisions in Phases II and III. The three phases of the SWERA model are illustrated in

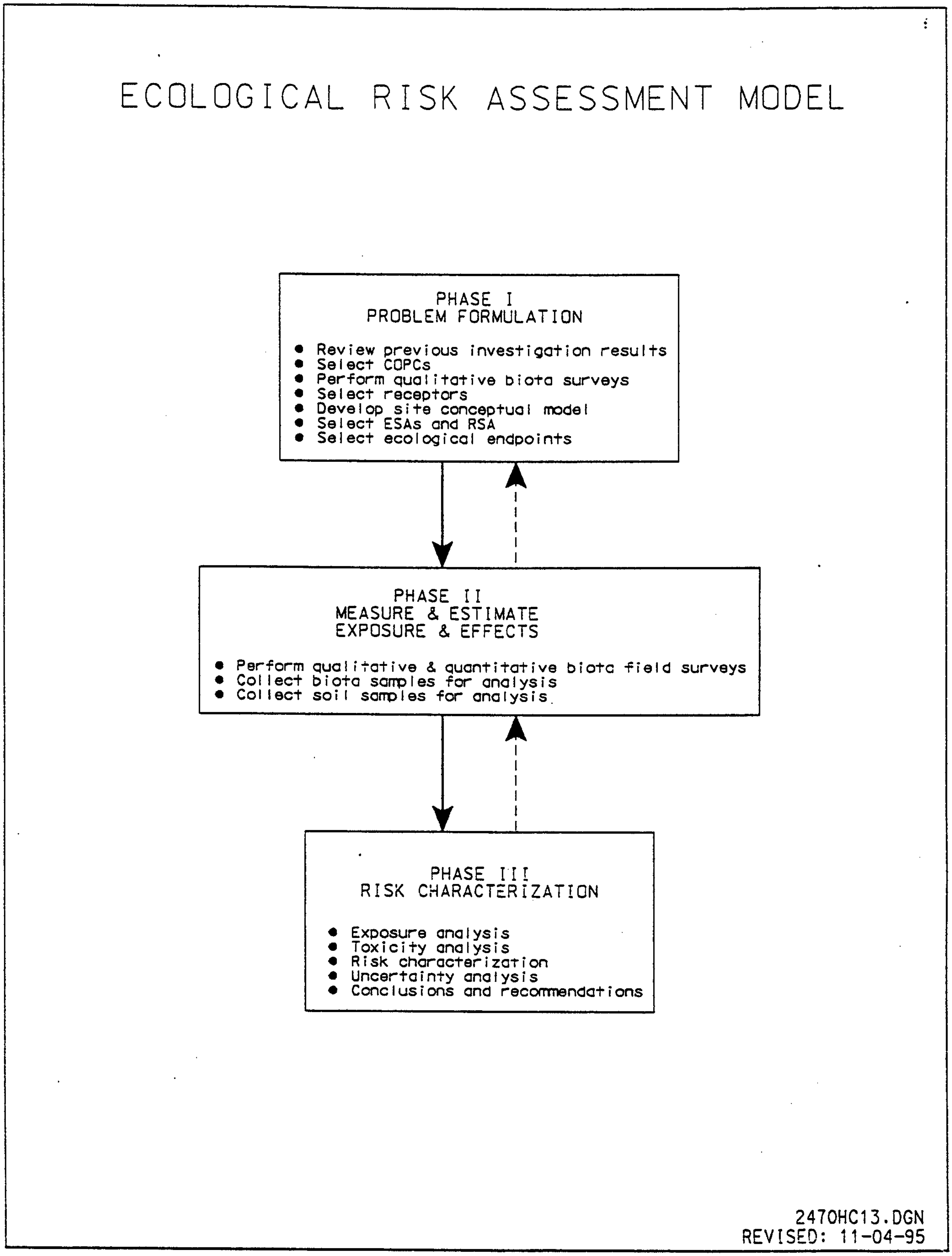

Figure 2-1. Ecological Risk Assessment Model

greater detail in Figures 2-2 through 2-4, respectively, including several key decision points based on findings from data analysis and evaluation activities. Data inputs for Phase I included facility records, previous investigation results, RI and RFI data from the Installation Restoration Data Management Information System (IRDMIS) database, USEPA toxicity databases, data from other ERAs, and data collected from previous qualitative surveys. The decision point for Phase I was the approval of the work plan (SWEAP/QAPjP) to allow Phase II to begin.

Phase II data inputs were derived through qualitative and quantitative ecological surveys, and biota tissue and soil sample collection and analysis. Key components of Phase II included the determination of exposure and adverse effects to key ecological receptors. Where possible, effects to higher level consumers not sampled were modeled.

Data inputs to Phase III included literature review and data analysis to link possible adverse effects to the occurrence of COPCs. Primary decisions included the determination of such linkage and whether risk of possible adverse effects was unacceptable.

2.1.1 Risk Assessment Process Overview

The risk assessment process shown in Figure 2-5 consists of three major components: (1) exposure analysis, (2) toxicity assessment, and (3) risk characterization. The first step in the process is the identification of those ecological values (or assessment endpoints) that may be at risk and require protection. The DQO process is an essential step in the problem formulation stage and is necessary for the development of a field sampling plan that will provide the data necessary to evaluate risk. A discussion of the DQO process as it relates to this SWERA is found in Section 2.1.3. Figures 2-6 through 2-8 illustrate how the more detailed steps of each component relate to one another and the overall risk assessment process.

The SWERA evaluates and summarizes available contaminant and biological data at TEAD. The data are then used to predict potential adverse effects to the environment due to possible contaminant releases from the TEAD facility. The major components of the SWERA are described in more detail below.

2.1.1.1 *Exposure Analysis*

2.1.1.1.1 ***Problem Formulation.*** The problem formulation component examines existing abiotic and biotic information for the TEAD facility, the types of contaminants present, and the ecotoxicological effects that could be expected due to contaminant exposure. This includes the determination of the assessment and measurement endpoints and the development of the conceptual site model. The purpose of this component is to formulate questions or hypotheses that the risk assessment can address and to provide the overall framework of the risk assessment.

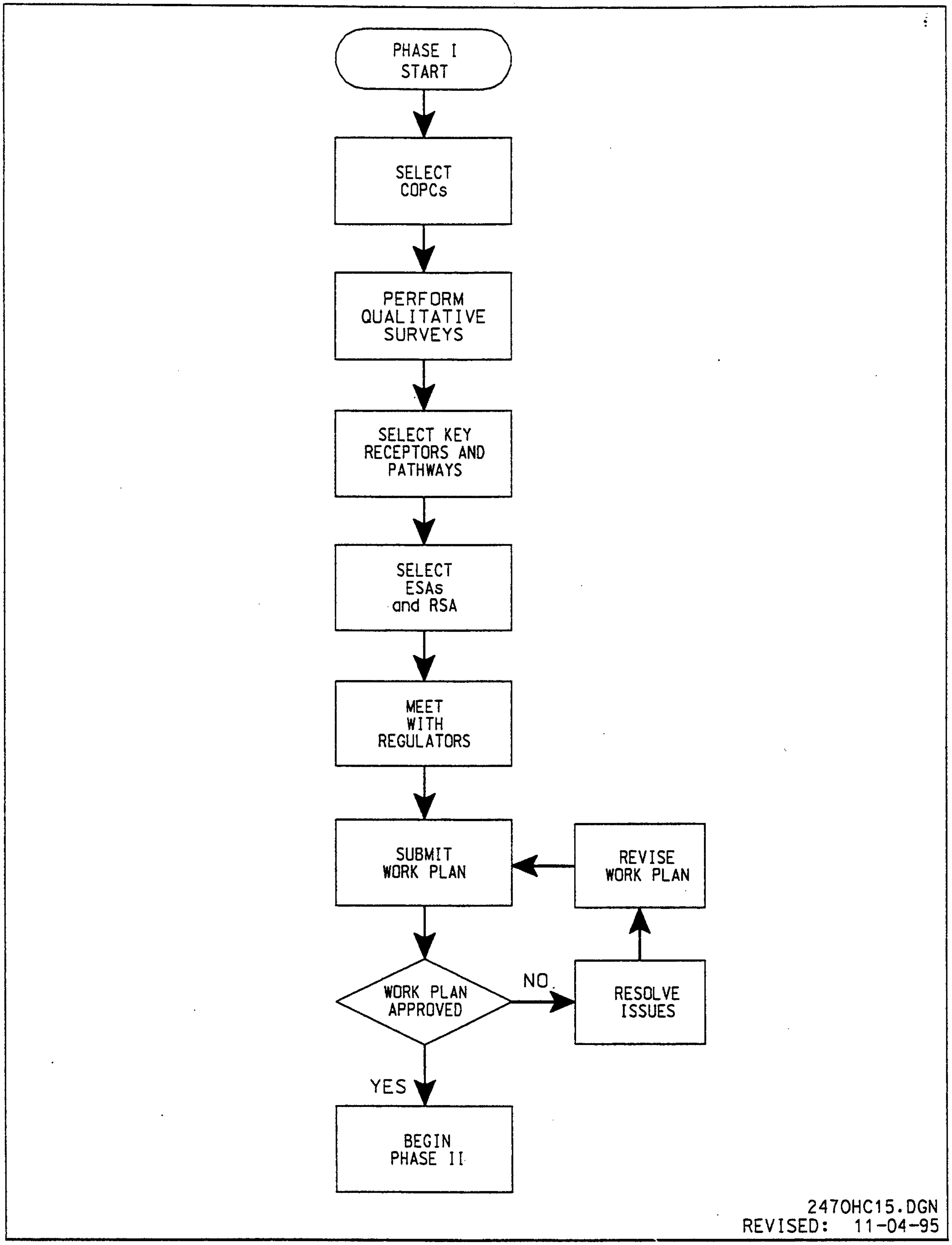

Figure 2-2. Logic Diagram for Phase I

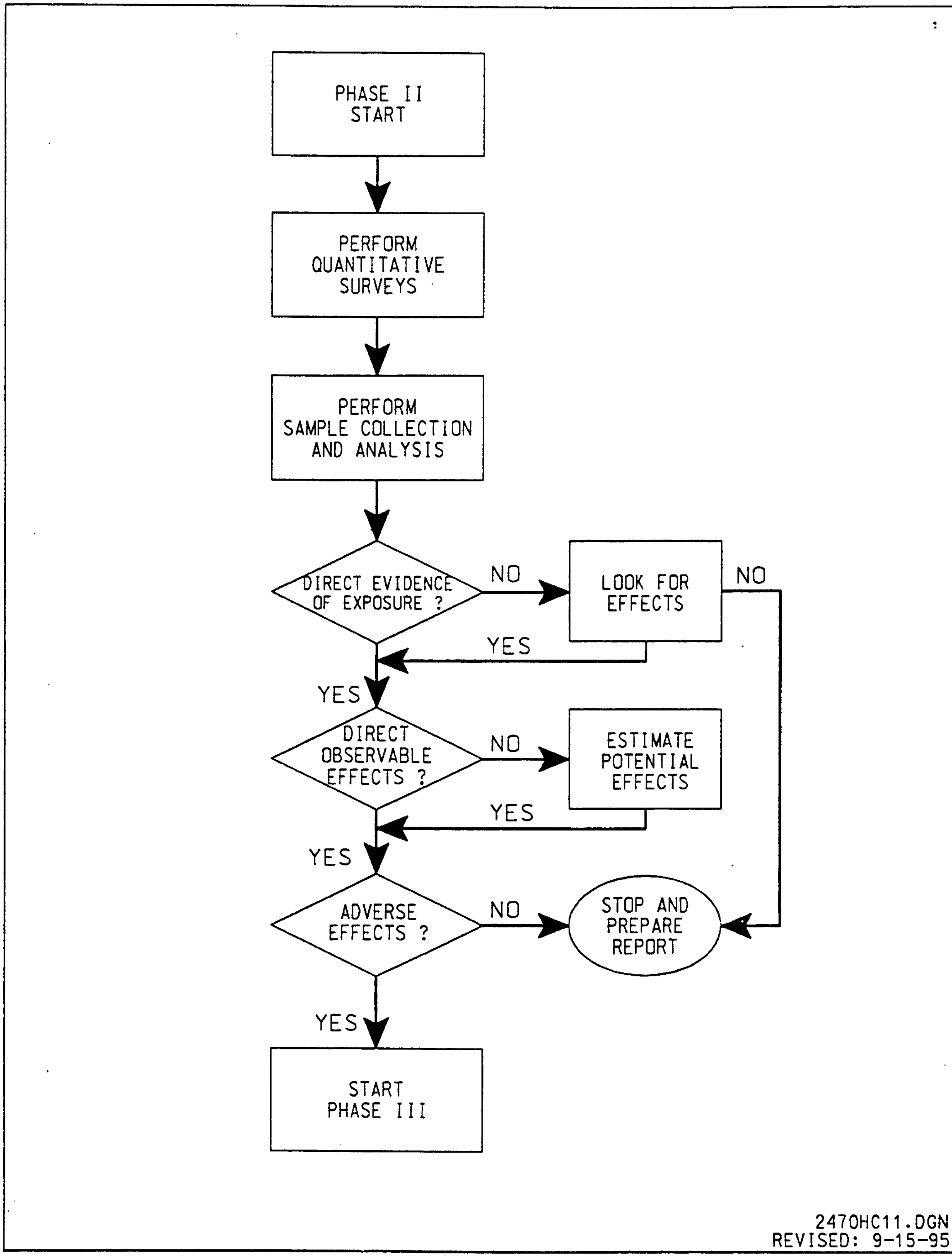

Figure 2-3. Logic Diagram for Phase II

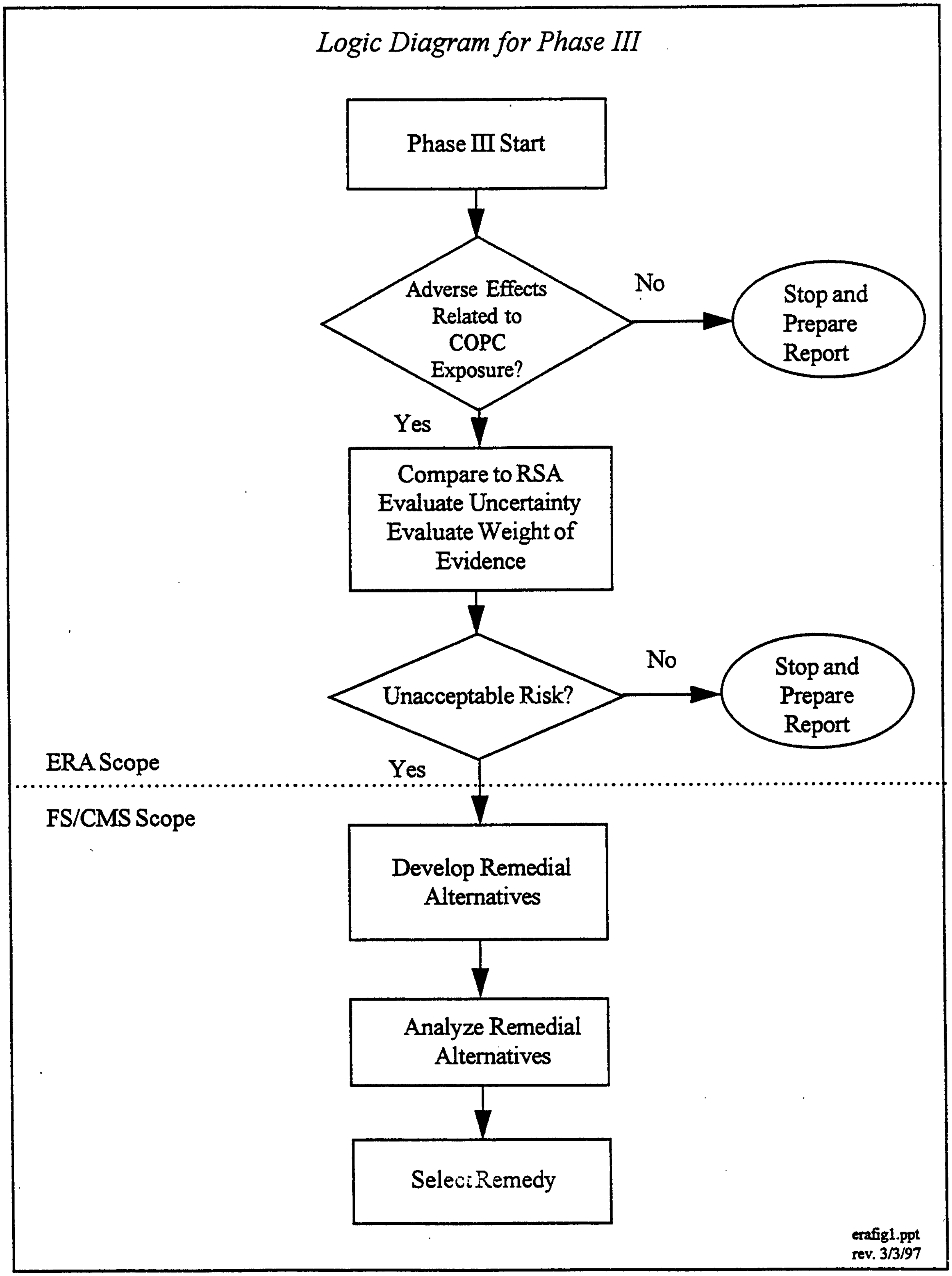

Figure 2-4. Logic Diagram for Phase III

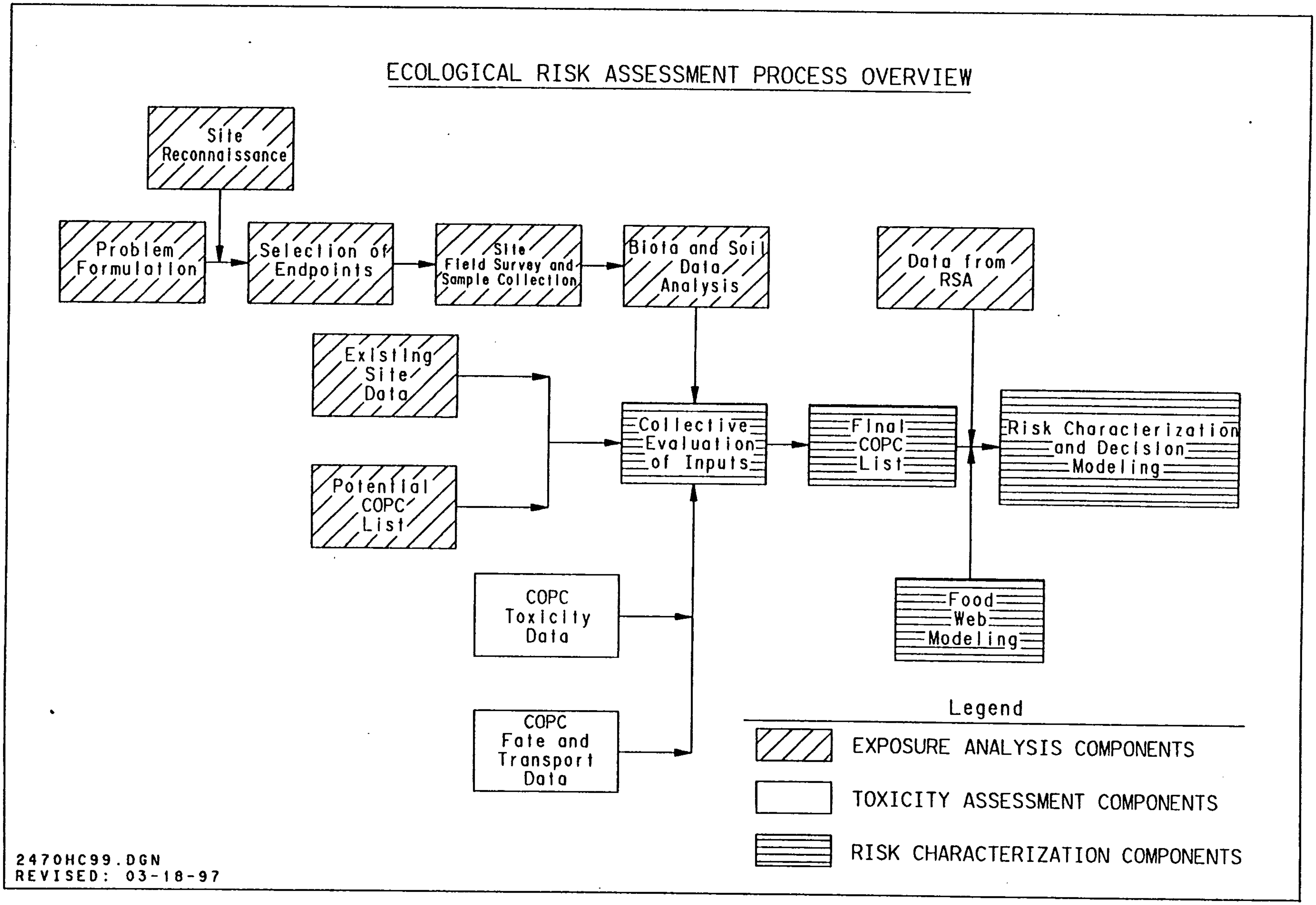

Figure 2-5. ERA Process Overview

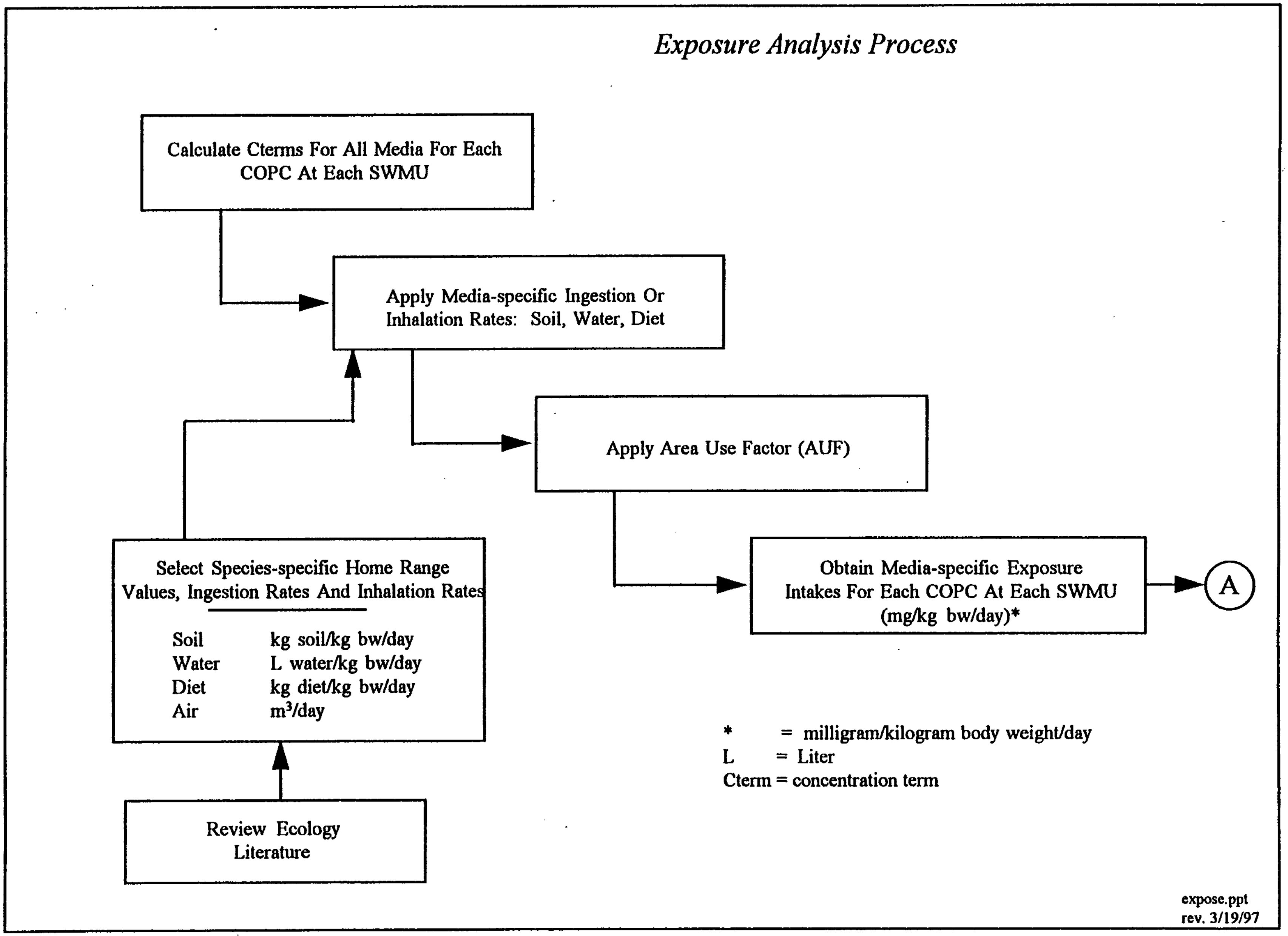

Figure 2-6. ***Exposure Analysis Process***

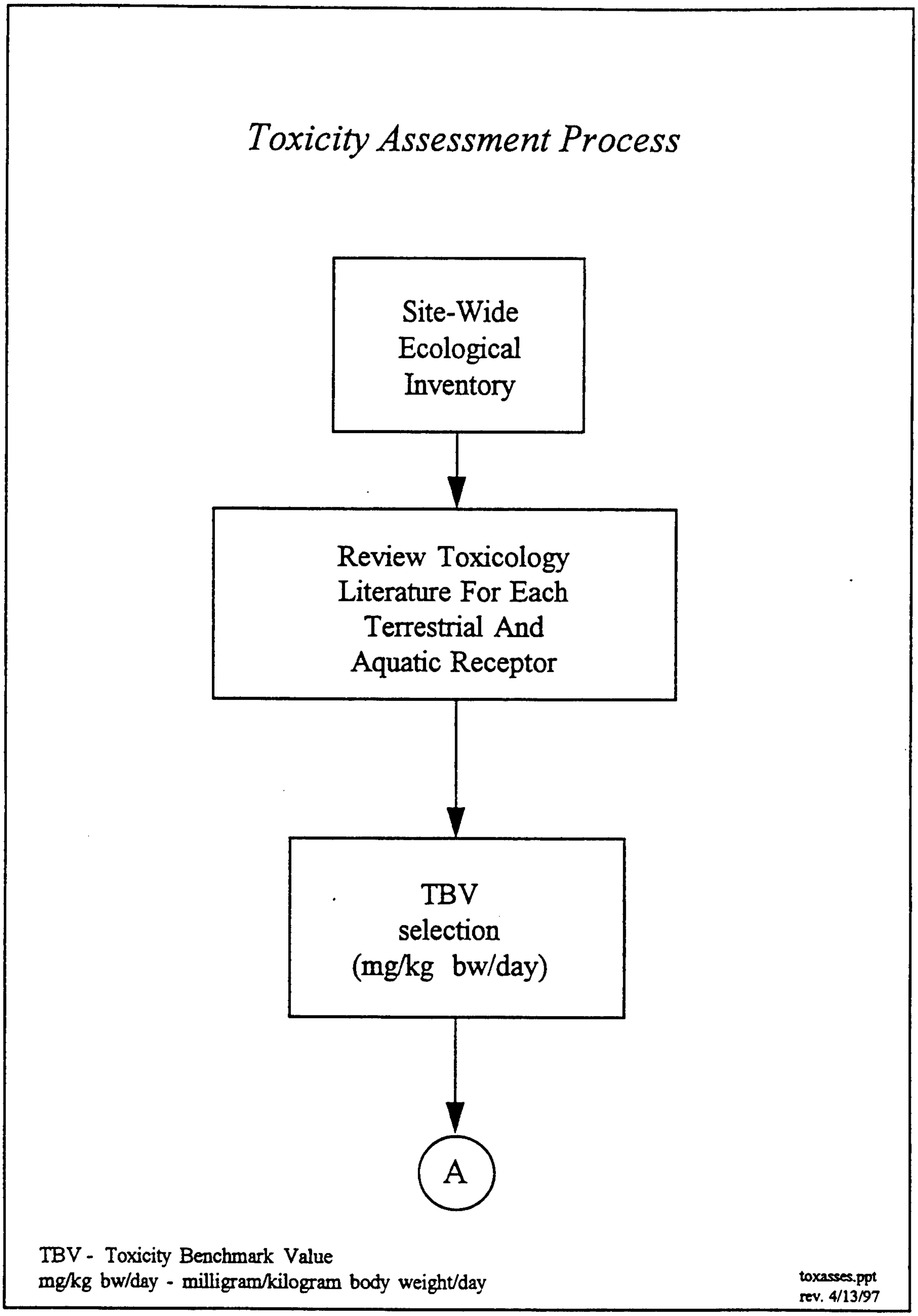

Figure 2-7. Toxicity Assessment Process

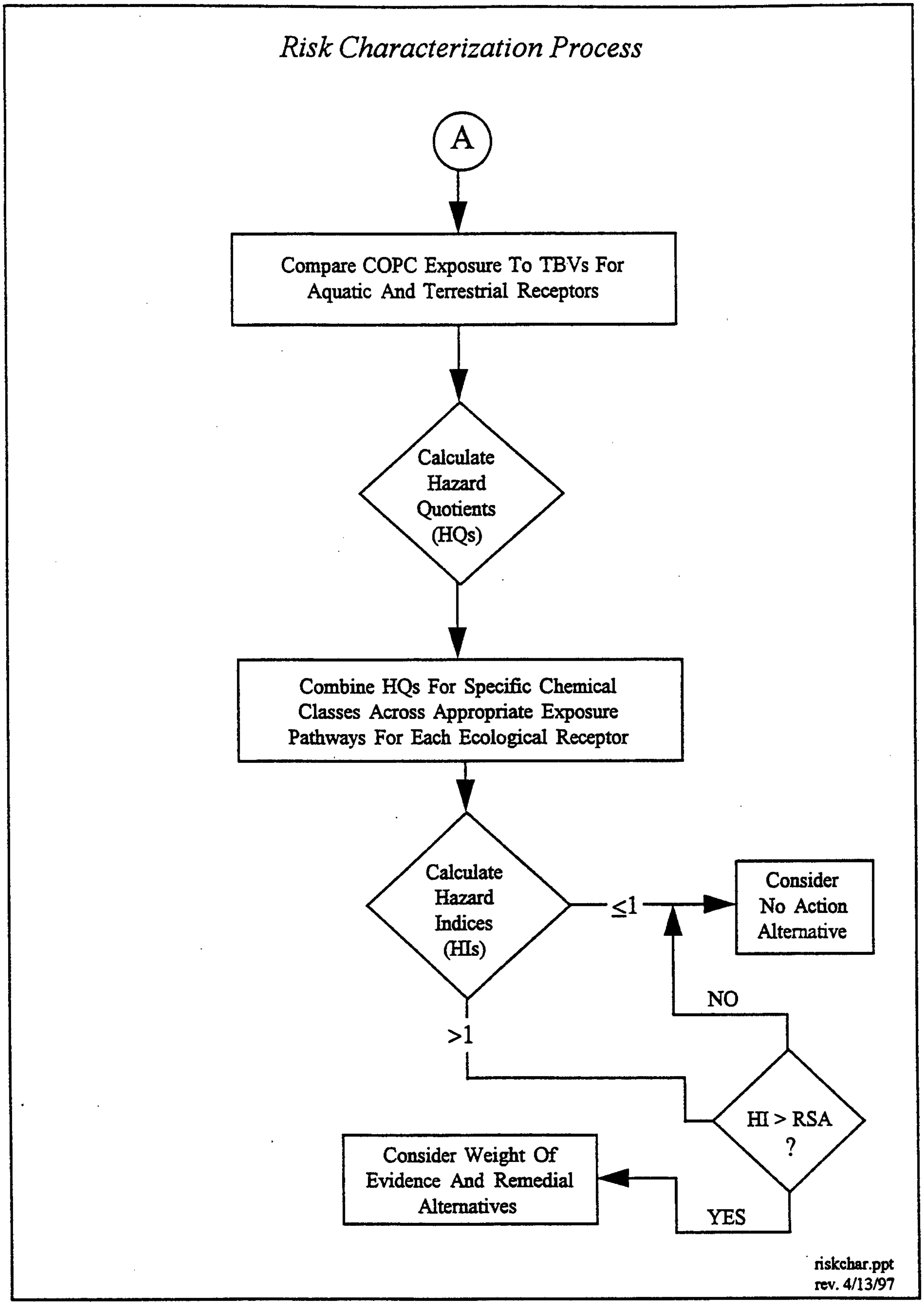

Figure 2-8. Risk Characterization Process

2.1.1.1.2 ***Selection of Assessment and Measurement Endpoints.*** Assessment endpoints are expressions of an environmental value deemed worthy of protection (e.g, threatened and endangered species, sensitive habitat, game animals). They represent the ultimate focus of the risk characterization, and link the risk management process to the measurement endpoints. The USEPA Framework Guidance (USEPA 1992d) lists the following three considerations in selecting assessment endpoints, in this order: (1) ecological relevance, (2) policy goals and societal values, and (3) susceptibility to stressor.

Measurement endpoints are variables that can be measured and which relate directly, or in some mathematical way, to the assessment endpoints. Assessment and measurement endpoints formulated for TEAD were based on the available site information as discussed in Section 2.1.2.

2.1.1.1.3 ***Conceptual Site Model.*** As part of the problem formulation, a conceptual site model was developed for the exposure pathways for the TEAD facility (Figure 2-9). Exposure pathways are the mechanism by which a contaminant in an environmental medium (i.e., the source) contacts an ecological receptor. A complete exposure pathway includes:

- Contaminant source
- Release mechanism that allows contaminants to become mobile or accessible
- Transport mechanism that moves contaminants away from the release
- Ecological receptor
- Route of exposure (e.g., dermal or direct contact, inhalation, or ingestion)

The major exposure pathways at TEAD are direct contact with contaminated abiotic media (i.e., plants in contact with contaminated soil), ingestion of abiotic media (i.e., ingestion of soil or surface water by birds or animals), and ingestion of contaminated biological media (i.e., ingestion of plants or animals). The conceptual site model assumes that dermal exposure (i.e., uptake of chemicals across the skin) by birds or mammals will be minimal and not contribute greatly to overall exposure. Air modeling data indicate that contaminant concentrations in air are likely to be highly localized around burn and detonation areas, and that air is therefore not likely to be an exposure medium. Thus, the air pathways are considered minor exposure pathways.

2.1.1.1.4 ***Analytical Data (Exposure Analysis).*** The analytical data are summarized and evaluated in the exposure analysis. Upper 95 percent confidence limits on the arithmetic mean (UCL95) values were used to represent the concentration term (Cterm). Use of the UCL95 implies that 95 percent of the time, the mean concentration will fall below this value. Concentrations of each COPC at each SWMU are summarized as part of the exposure analysis. When the UCL95 exceeded the maximum detected value at the SWMU for a particular analyte, the maximum value was used to represent the Cterm.

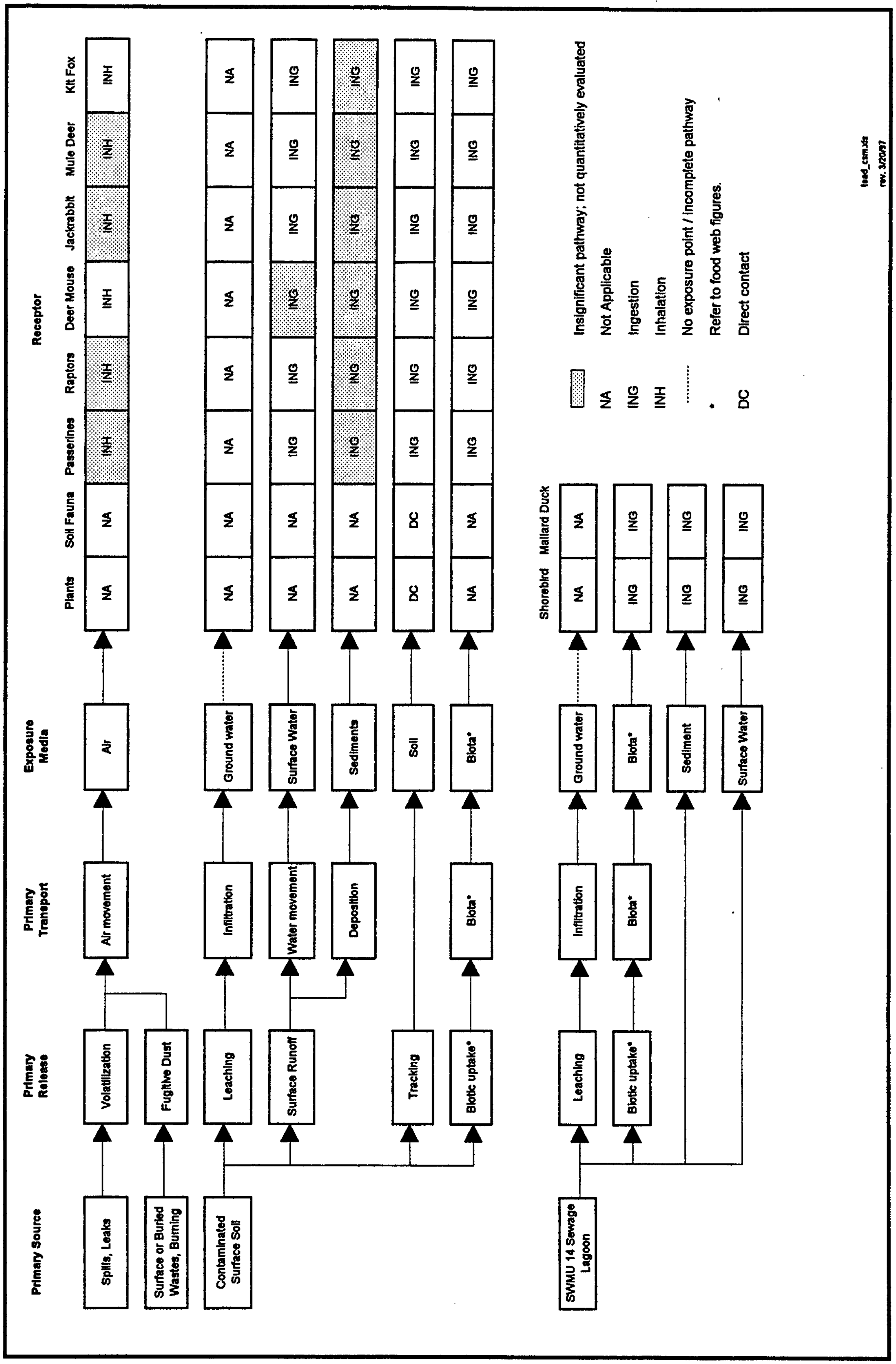

Figure 2-9. TEAD Conceptual Site Model

The Cterms or exposure point concentrations (EPCs) in mg chemical (i.e., COPC) in each media were calculated and used to obtain daily exposure intakes. Daily exposure intakes, hereafter referred to simply as intakes, are estimated by multiplying the daily media ingestion rate for a given receptor by the Cterm in the same media. For example, the arsenic concentration in surface water (in milligrams/liter, mg/L) is multiplied by the amount of water an American kestrel drinks each day (liters/kg bw/day) to obtain the chemical intake (mg/kg bw/day). Exposure intakes were calculated for each COPC at each SWMU for each abiotic media for which data were available. (Note: Currently, USEPA Region VIII indicates a preference for the term "dose" rather than "intake"; however, due to the extensive revisions which would be necessary to implement this change in the revised final SWERA, the term "intake" will be used synonymously with "dose" throughout this report.)

Some contaminants are absorbed into tissues (i.e., uptake) at rates exceeding the rate at which they are lost, a process termed bioaccumulation. Uptake and loss rates are chemical and species specific. The mechanisms of bioaccumulation uptake of chemicals from diet or water and of biomagnification (food chain transport of chemicals) raise the possibility that contaminants will be found in biological media at concentrations exceeding those found in abiotic media.

Some plant and animal species were sampled and analyzed for contaminant concentrations. However, not all animals can be readily sampled (e.g., threatened and endangered species, or species whose populations are too low to allow adequate sample size for statistical treatment). The analytical data for the sampled species were used to estimate dietary intakes for animals likely to feed on them (see Figure 2-9). In addition, a terrestrial and an aquatic food web model were constructed and used to predict dietary intakes in the absence of analytical data for a given taxon (e.g., benthic invertebrates and waterfowl from SWMU 14). The models were also used at SWMUs for which biological data were unavailable because sampling was conducted in selected representative areas and not in all areas.

Species occurrence, density, and other population parameters are evaluated in this assessment. The goal of the data collection was to determine if any overt ecological effects are present that can be related to contaminant concentrations in the environment. The risk assessment is concerned primarily with effects on populations except in the case of Special Status species. The population parameters in the reference study area (RSA) were compared to population parameters for populations on TEAD to determine if statistically significant differences exist. The analysis is not highly rigorous because (1) a limited amount of field data was collected, (2) populations can shift seasonally and annually in different locations, and (3) observational data do not provide evidence of cause and effect. However, use of these data serves as weight-of-evidence (WOE) for conclusions made in the risk characterization.

2.1.1.2 *Toxicity Assessment*

The toxicity assessment summarizes the available information regarding the toxicity of each of the COPCs to wildlife species or plants. A literature search was conducted to provide the

information for this assessment. The data are summarized along with the toxicological effect reported in the corresponding study. Data were not available for all of the chemicals and species addressed in the SWERA, and the values used to predict risk were often extrapolated from a similar species. The goal of the toxicity assessment is to obtain as many chemical and species-specific toxicity benchmark values (TBVs) as possible for the risk characterization. Based upon discussions with the USEPA, uncertainty factors (UFs) associated with intertaxon extrapolation, threatened and endangered species (Special Status species), and study endpoint and study duration were incorporated in the final TBV (Section 7.3).

2.1.1.3 *Risk Characterization*

The exposure intakes for birds and mammals were compared to the toxicity benchmark values to obtain a hazard quotient (HQ):

(Equation 2-1)

$$HQ = Exposure\ Intake/TBV * AUF\ (area\ use\ factor)$$

The exposure point concentrations for COPCs in soil and sediment or surface water at each SWMU were compared directly to the corresponding TBVs for plants and soil fauna, rather than calculating daily intakes. Most of the toxicological information for these taxa are in units of mass chemical per mass soil or growth medium. In addition, information that could be used to calculate the dietary ingestion rates for invertebrates is largely lacking in the literature reviewed. (**Note**: Currently, USEPA Region VIII indicates a preference for the term "dose" rather than "intake"; however, due to the extensive revisions which would be necessary to implement this change in the revised final SWERA, the term "intake" will be used synonymously with "dose" throughout this report.)

The risk characterization weighs the results of the exposure analysis and biometric data. The exposure data and toxicity information for each specific chemical and receptor combination are used to derive HQs. HQs for each receptor are summed by group for the various chemical classes (e.g., dioxins and furans) across exposure pathways to obtain a total hazard index (HI). HIs exceeding 1 for an ecological receptor may indicate the potential for risk and are evaluated further in the risk characterization process. HIs for TEAD SWMUs are compared to the RSA HIs, and the ratio of these HIs becomes the primary basis for categorization of risk.

2.1.1.4 *Uncertainty Analysis*

Uncertainty analyses are performed on the assumptions and data that comprise the SWERA. The uncertainty analysis (UA) highlights areas of the SWERA that are uncertain, and the potential impact that this has on the results. This process strengthens the SWERA conclusions and aids in the formulation of recommendations. The detailed UA is provided in Section 7.6.

2.1.2 Ecological Endpoint Selection

The Phase I portion of the SWERA was designed to characterize the site ecosystems and communities using previously gathered information and current field observation data. Ecological endpoints or assessment endpoints are the outcome of or the effect that exposure to stressors have on individuals from lower trophic levels through an entire ecosystem (Suter 1989). Meaningful ecological endpoints characterize the relationship between COPC levels and potential adverse effects.

In order to identify adverse impacts on the biota, the following factors were considered in the selection of the assessment endpoints:

- The identification of the nature of actual and potential impacts, specifically whether:
  - –Community structure would be affected through trophic structure alterations or other community level indicators of disturbance
  - –Ecological processes such as primary production and nutrient cycling rates would be altered
  - –Identified species would be affected, in particular, threatened or endangered ones

- The evaluation of potential intensity of impacts as high, medium, or no effect.

- The application of a degree of certainty in order to differentiate between circumstances where either data or references are sufficient for probability projections to be made versus the situation where the stress-response relationships are poorly understood or are of a highly infrequent occurrence.

- If warranted by the first three considerations, the derivation of a probable time scale for recovery of the biotic communities following cessation of the stressor.

Measurement endpoints are a means to directly relate the COPCs to an ecological endpoint. These are quantifiable values that can be directly measured in the field or laboratory (or can be summaries of data reported in scientific literature such as LC_{50} values). Measurement endpoints provide a means to determine if the assessment endpoints have been affected and, if so, to what degree. The use of measurement endpoints requires the comparison of the selected SWMU to a reference area that is similar in biological and physical properties and exhibits no apparent exposure pathways from contaminated sources to the key receptor species. Endpoints for this SWERA are outlined in Table 2-1.

2.1.3 Data Quality Objectives Process

The development of the DQOs followed the seven steps recommended in USEPA's *Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objectives Process* (USEPA 1993b). The DQO process used in this SWERA is

Table 2-1. TEAD Assessment and Measurement Endpoints

Assessment Endpoint	Measurement Endpoint
Protection of mammals [a], avian species [b], and Special Status species[c] from adverse effects due to elevated concentrations of COPCs in forage/prey species.	Concentrations of COPCs [d] in biota [e]. Food Web Model output for SWMUs [f] with no biota data. Vegetation and small mammal biometric data including distribution, abundance, occurrence, density, diversity, age, sex, body weight.
Protection of mammals, avian species, and Special Status species from adverse effects due to elevated concentrations of COPCs in surface soils, or due to loss of forage/prey species as a result of elevated soil concentrations.	Concentrations of COPCs in surface soil. Vegetation and small mammal biometric data including distribution, abundance, occurrence, density, diversity, age, sex, body weight.
Protection of mammals, avian species, and Special Status species from adverse effects due to elevated concentrations of COPCs in surface water.	Concentrations of COPCs in surface water. Vegetation and small mammal biometric data including distribution, abundance, occurrence, density, diversity, age, sex, body weight.
Protection of waterfowl and waders from adverse effects due to elevated concentrations of COPCs in sediment or surface water at the SWMU 14 Sewage Lagoons.	Concentrations of COPCs in sediment and surface water.
Protection of waterfowl and waders from adverse effects due to elevated concentrations of COPCs in forage/prey at SWMU 14 Sewage Lagoons.	Food Web Model based upon predicted concentrations of COPCs in benthos.
Protection of the Bald Eagle ingesting waterfowl containing elevated concentrations of COPCs at the SWMU 14 Sewage Lagoons.	Food Web Model results for estimated concentrations of COPCs in waterfowl.

Note.—Refer to Table 2-2 for more detail.
[a]Mammals include mule deer, kit fox, jackrabbit, and deer mouse.
[b]Avian species include raptors and migratory bird species.
[c]Special Status species include the bald eagle and golden eagle.
[d]Chemicals of potential concern.
[e]Biota include jackrabbit, vegetation, and invertebrates.
[f]Solid waste management units.

summarized below and shown in Figure 2-10. The intent of the DQO process is to clearly define any problem that requires that new data be gathered and to ensure that the data collected are sufficient in type, quantity, and quality to form the basis for decisions. The result of following the process is a statistically valid sample collection plan. Following the Fall 1994/Fall 1995 field sample collection, the DQOs have been evaluated against the assessment and measurement endpoints identified in Tables 2-1 and 2-2.

This process of evaluation continues throughout the report and is concluded in Section 7.7, Risk Description.

It is important to understand that each DQO step was interwoven into the SWERA approach and framework, and as such, the steps may not appear consecutive within the report. This

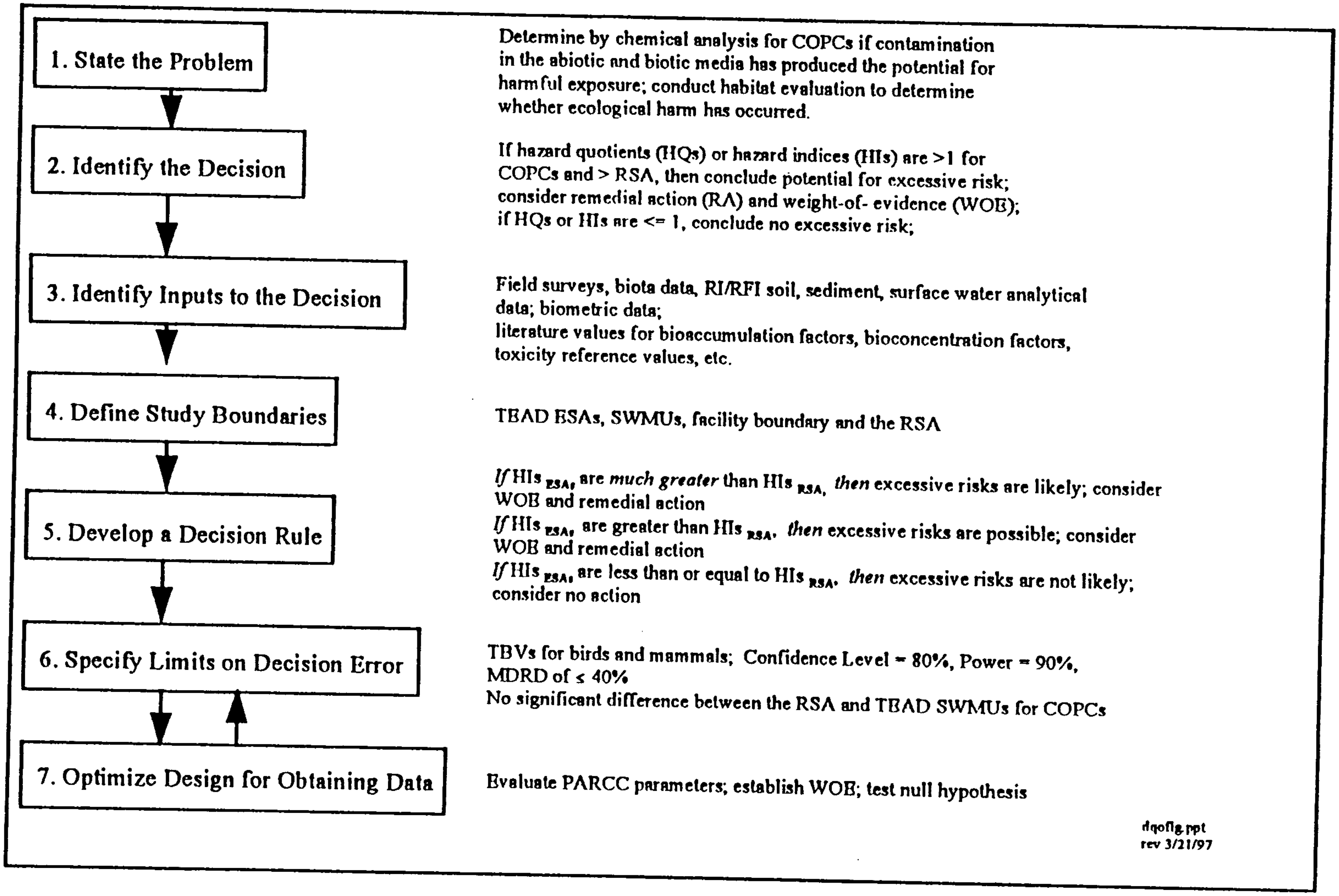

Figure 2-10. The Seven-Step DQO Process for the TEAD SWERA

Table 2-2. Data Quality Objectives for the TEAD Ecological Risk Assessment (Co-located Soil and Biota Sample Collection)

Assessment Endpoint	Problem/ Objective (1)	Decision (2)	Data Input/ Source (3)	Data Action Levels (5)	Study Area Boundaries/ Parameters (4)	Limit on Decision Error (6)
Protection of mammals [a], avian species [b], and Special Status species [c] from adverse effects due to elevated concentrations of COPCs [d] in forage/prey species.	Determine if Cterm [e] concentrations of COPCs in key forage/prey species could decrease population success in ecological receptors.	If Cterm concentrations of COPCs in key forage/prey species do not exceed TBVs [f] for ecological receptors, then conclude no excessive risk; otherwise, consider RAs [g] and WOE [h].	COPCs in key prey/forage species from TEAD [i] ESA [j] SWMUs [k] and RSA [l]. TEAD and RSA biometric data	TBVs for ecological receptors.	TEAD [m] ESAs; RSA; 1994-1995 field sampling event.	Adequate sample size to allow an alpha (α) of 0.2 and a beta (β) of 0.1.
Protection of mammals, avian species, and Special Status species from adverse effects due to elevated concentrations of COPCs in surface soils, or due to loss of prey/forage species as a result of elevated soil concentrations.	Determine if Cterm concentrations of COPCs in surface soils could decrease population success in ecological receptors.	If Cterm concentrations of COPCs in soil do not exceed TBVs for ecological receptors based on direct ingestion of surface soil over home range, then conclude no excessive risk; otherwise, consider RAs and WOE.	COPCs in surface soil from TEAD SWMUs and RSA. TEAD and RSA biometric data	TBVs for ecological receptors.	TEAD SWMUs and RSA.	Adequate sample size to allow an α of 0.2 and a β of 0.1.
Protection of mammals, avian species, and Special Status species from adverse effects due to elevated concentrations of COPCs in surface water.	Determine if Cterm concentrations of COPCs in surface water could decrease population success in ecological receptors.	If Cterm concentrations of COPCs in surface water do not exceed TBVs for ecological receptors based on direct ingestion of surface water, then conclude no excessive risk; otherwise, consider RAs and WOE.	COPCs in surface water from TEAD SWMUs and RSA.	TBVs for ecological receptors.	TEAD SWMUs and RSA.	Adequate sample size to allow an α of 0.2 and a β of 0.1.

Table 2-2. Data Quality Objectives for the TEAD Ecological Risk Assessment (Co-located Soil and Biota Sample Collection) (continued)

Assessment Endpoint	Problem/ Objective (1)	Decision (2)	Data Input/ Source (3)	Data Action Levels (5)	Study Area Boundaries/ Parameters (4)	Limit on Decision Error (6)
Protection of waterfowl and waders from deleterious effects due to elevated concentrations of COPCs in sediment or surface water at the SWMU 14 Sewage Lagoons.	Determine if predicted COPC concentrations in sediments or surface water could decrease population success in water fowl or wading birds.	If predicted COPC concentrations in sediments or surface water do not exceed TBVs for waterfowl or waders, then conclude no excessive risk; otherwise, consider RAs and WOE.	COPCs in sediment or surface water from SWMU 14	TBVs for waterfowl, wading birds.	SWMU 14	Adequate sample size to allow an α of 0.2 and a β of 0.1.
Protection of waterfowl and waders from adverse effects due to elevated concentrations of COPCs in forage/prey at the SWMU 14 Sewage Lagoons.	Determine if predicted Cterm concentrations of COPC concentrations in benthic invertebrates could decrease population success in water fowl or wading birds.	If predicted Cterm concentrations of COPCs in invertebrates do not exceed TBVs for waterfowl or waders, then conclude no excessive risk; otherwise, consider RAs and WOE.	Food web model output	TBVs for waterfowl, wading birds.	SWMU 14	Adequate sample size to allow an α of 0.2 and a β of 0.1.
Protection of the bald eagle ingesting waterfowl containing elevated concentrations of COPCs at the SWMU 14 Sewage Lagoons.	Determine if COPCs in waterfowl or wading birds could decrease survivability or reproductive success in individual bald eagles.	If COPCs in waterfowl or waders do not exceed TBVs for bald eagles, then conclude no excessive risk; otherwise consider RAs and WOE.	COPCs in water, sediment from SWMU 14; food web model output	TBVs for bald eagles.	SWMU 14	Adequate sample size to allow an α of 0.2 and a β of 0.1.

[a]Mammals include mule deer, kit fox, jackrabbit, and deer mouse.
[b]Avian species include raptors and migratory bird species.
[c]Special Status species include the bald eagle and golden eagle.
[d]Chemicals of potential concern.
[e]Concentration term.
[f]Toxicity benchmark values.
[g]Remedial alternatives.
[h]Weight-of-evidence.
[i]Tooele Army Depot.
[j]Ecological study areas.
[k]Solid waste management units.
[l]Reference study area.

section presents only an overview, whereas subsequent discussions (Section 2.2) provide greater detail on how the planning process was actually implemented.

2.1.3.1 *Formulate Problem*

Step 1 in the DQO process is to concisely define the problem so that the focus of the study will be clear. A general statement of the problem might be: Using chemical analysis of the abiotic and biotic media, determine if harmful exposure to COPCs is occurring to the ecological community at TEAD. Table 2-2 lists several problems (or objectives) identified during the SWERA in terms of the assessment endpoints discussed in Section 2.1.2.

2.1.3.2 *Identify the Decision*

Step 2 in the DQO process is to define the decision to be made with the analytical data collected during the field sampling activities. The outputs from this step are a statement of the decision or decisions and a list of actions or possible outcomes that would result from each resolution of the decision. For each objective identified above in Step 1, a decision statement is provided in Table 2-2.

2.1.3.3 *Identify Inputs to the Decision*

The purpose of Step 3 in the DQO process is to identify the informational inputs or criteria that will be required to resolve the decision and determine which inputs require environmental measurements. COPC concentrations in soil and biota as well as ecological parameters of diversity, density, and biomass are significant inputs into the decision-making process. It is not sufficient to draw conclusions solely from one data input such as COPC concentrations without comparing that information to the effect, if any, on the ecological receptor or habitat.

2.1.3.4 *Define the Study Boundaries/Parameters*

The purpose of Step 4 in the DQO process is to specify the spatial and temporal circumstances and characteristics that affect the decision. This includes defining the domain or geographic area of interest, determining when to collect the data, and identifying practical constraints on data collection. The time frame to which the data apply must also be identified when appropriate.

The Ecological Study Areas (ESAs) and the RSA selected earlier in the SWERA work plan (Rust E&I 1994c) are identified in Section 2.2.4 and provide the study area boundaries. Each SWMU identified during the COPC screening process, regardless of its inclusion in an ESA, was also evaluated for ecological risk.

The analytical data for Group C SWMUs (SWMUs 49-57) and AOCs-3 and -4 were not available at the time of the COPC screening (Fall 1994). *Preliminary* data (SAIC 1996b) from these locations were recently made available. These SWMUs are located in the Base Realignment and Closure (BRAC) parcel consisting of the Maintenance and Administration areas and provide little, if any, ecological habitat. If a SWMU in the BRAC parcel was designated for future use by the public as a "park land", the SWMU would be considered for evaluation. The possibility exists that portions of SWMUs 52 and 57, which are open areas located near the facility's main gate, may be used for recreational purposes. However, contamination found at these areas will likely require remediation for human health purposes, which will likely mitigate any potential ecological risks. These sites have not been evaluated further in this SWERA.

The time frame to which this SWERA applies is limited and, as such, represents only a snapshot in time of the TEAD community and habitat. For this reason, it is appropriate to identify this as a baseline ecological risk assessment.

2.1.3.5 *Develop a Decision Rule*

The outputs from the previous steps are integrated in Step 5 to create a statement or statements that describe the logical basis for choosing from alternative actions. This statement takes the form of an "if . . . then . . ." rule, which defines the conditions that would cause the decision maker to choose among alternative actions. Examples of these statements are summarized in Table 2-2. A specific decision rule is provided as follows:

> If the soil concentrations at TEAD are higher than those at the RSA for a given COPC, *and* exceed the toxicity benchmark value for a particular key receptor, then the risk manager may choose remediation or evaluate the risk based upon the weight-of-evidence.

The TBVs will be compared to estimated exposure intakes based on Cterms in order to derive HQs. The exposure analysis (Section 7.2.2) describes this process in detail.

The HQs will be evaluated as follows in Section 7.4.1:

- *If* the $HQ_{TEAD} > 1$ *and* HQ_{TEAD} is $> HQ_{RSA}$ for a given COPC, *then* this situation may indicate the potential for excessive risk. The risk manager would likely consider the weight-of-evidence and remedial action.

- *If* the $HQ_{TEAD} > 1$ *and* $HQ_{TEAD} < HQ_{RSA}$ for a given COPC, *then* this situation would indicate a potential for risk. The risk manager would likely consider the weight-of-evidence and the No Action Alternative.

- *If* the $HQ_{TEAD} < 1$, *then* this situation would indicate little or no potential for risk. The risk manager would likely consider the weight-of-evidence and the No Action Alternative.

In a similar fashion, the HIs for the TEAD ESA SWMUs will be compared to the RSA HIs in the risk characterization of Section 7.4.2. The comparisons provided above will also take into account the alternative lines of evidence based on the results of the biometric data collection.

2.1.3.6 *Specify Limits on Decision Errors*

The purpose of Step 6 is to minimize uncertainty in the data by specifying acceptable limits on errors for decisions that are used to establish performance goals. It is necessary to determine the possible range for the parameter of interest and to define both the types of decision errors and the potential consequences of the errors. A "gray area" is established where the consequences of an incorrect decision are relatively minor. Based upon the null hypothesis (H_0) test, there are two types of decision errors: false positives (Type I) and false negatives (Type II). A Type I error occurs when a decision maker rejects the null hypothesis (i.e., decides that the null hypothesis is false when it is actually true). Type II errors occur when the decision maker accepts the null hypothesis (i.e., decides that the null hypothesis is true when it is actually false). USEPA guidance recommends a minimum confidence of 80 percent (1-alpha (α) or α=0.2) for a Type I error or false positive, and a minimum power of 90 percent (1-beta (β) or β=0.1) for a Type II error or false negative with a minimum detectable relative difference (MDRD) between 10 and 20 percent (*Guidance for Data Useability in Risk Assessment, Part A*, USEPA 1992c). From a risk assessment standpoint, the true state of nature should be defined with the most severe decision error as the basis for the null hypothesis, and the burden of proof rests on the alternative hypothesis (H_a). A more comprehensive discussion of this subject is found in QA/G-4 (USEPA 1993b).

A generalized example of the null hypothesis test for the SWERA follows. The Cterm concentration from soil data is compared to the TBV for each COPC both at TEAD and the RSA:

- TEAD
  H_0: Cterm > TBV, problem
  H_a: Cterm < TBV, no problem
- RSA
  H_0: Cterm > TBV, problem, but not in ERA scope
  H_a: Cterm < TBV, no problem

Table 2-2 specifies the limits on the decision errors for the corresponding problem statements/ objectives.

2.1.3.7 *Optimize Design for Obtaining Data*

The overall goal of the DQO process was to design a sampling and analysis plan (SAP) in the SWEAP/QAPjP (Rust E&I 1994c) that would provide valid data for risk characterization and meet the needs of the data user (decision maker).

2.2 PRE-FIELD ACTIVITIES

Prior to the SWEAP/QAPjP approval and the Fall 1994 field sampling season, other SWERA activities occurred which included the following:

- Evaluation of the TEAD background data set for use in the COPC screening process
- COPC screening and literature review
- Key receptor selection
- Ecological measurement and assessment endpoints formulation based upon habitat evaluation, protection of Special Status species, and initial review of COPCs
- Selection of SWMUs for inclusion in ESAs which contained suitable habitat and representative contamination
- Selection of the RSA

The following sections provide detailed discussion of these activities.

2.2.1 TEAD Background Evaluation

This section contains an analysis of background data for the soil media at TEAD. The data sources are described, and the methodologies for selecting the background values for metals and cyanide are summarized. The background values were used in the COPC selection process and for comparison with ESA-SWMU detects as shown in Sections 5.0 through 5.9. Also, RSA soil values have been assembled as discussed in Sections 5.0 and 5.12 for comparison against SWMU detects.

2.2.1.1 *TEAD Background Sampling Program*

Background soil samples were collected during 2 concurrent investigative programs from 10 locations across TEAD during 1992. A total of 20 soil samples, including 1 field duplicate, were collected from locations assumed to be free from contamination based on historical release information. The sampling locations are presented in Figure 2-11. Six background locations were sampled as part of the TEAD Phase I Suspected Releases RFI (Montgomery Watson 1993), and four background locations were sampled as part of the first phase of the RI for OUs 4 through 10 (Rust E&I 1994a).

During the Round 1 investigation of the Phase II Known Releases RFI for TEAD, Rust E&I selected an additional background sample location to replace the two samples collected at location BK-003. These samples were thought to have been collected in an area with surface contamination. The new location, BK-005, is also shown in Figure 2-11. Additional SWMU-specific background samples were collected in 1993 for the TEAD Suspected Releases RFI. Because these samples form SWMU-specific background sets for four suspected release SWMUs, they were not included in the data set for the TEAD overall background set. At each location, except SB-BK-004 and SB-BK-006, two background soil samples were

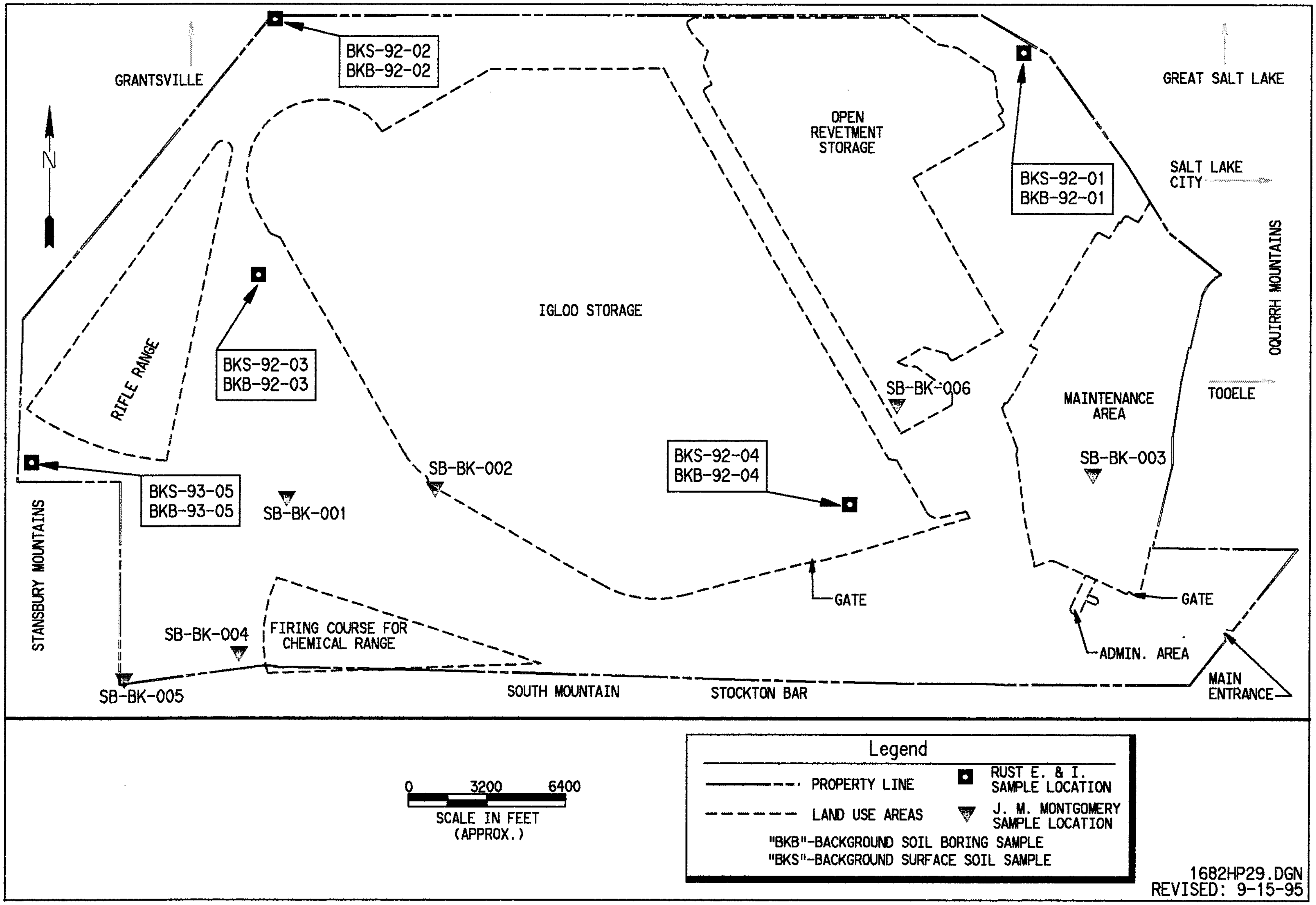

Figure 2-11. Background Soil Sample Locations at TEAD

collected: one from the surface and one from either the 2- or 3-foot sample interval. At SB-BK-004, a background soil sample and a field duplicate were collected at the surface, and one background soil sample was collected from the 3-foot interval. At SB-BK-006, one background soil sample was collected from a depth of 10 feet only. All background soil samples were analyzed for metals. In addition, selected samples were analyzed for cyanide (13 samples and a duplicate), pH (13 samples), and anions (bromide, chloride, fluoride, phosphate, and sulfate: varied subsets). Summaries of the analytes (metals and cyanide) detected in the background samples are shown in Table 2-3. Values in parentheses were not included in the calculation of summary statistics provided later in Table 2-5. The summary statistics for the anion data are presented in Table 2-4 and represent only the 0-to-2-foot soil profile in accordance with the approach used in the COPC Screening Process presented in Section 2.2.2.

2.2.1.2 *Statistical Evaluation of TEAD Background Data Set*

A database was created consisting of all the records from the analysis of the background samples for metals and cyanide. The data were inspected to determine if any of the data records had been qualified, rejected, or flagged, and to determine the impact on the data usability. Data with "K" flag codes were dropped from the data set. According to the IRDMIS data dictionary, a "K" flag code indicates "reported results affected by interference or high background." Due to dilutions, records flagged with a K have certified reporting limits (CRLs) much greater than the USAEC CRLs and some of the detected values for the particular analyte. Of the preliminary data, 31 records had to be dropped due to K flag codes and the resulting high CRLs: 7 records for antimony, 7 for arsenic, 1 each for beryllium and cadmium, 8 for selenium, and 8 for thallium. The rest of the data was acceptable for inclusion in the data set.

The duplicate pair for the one surface soil sample was averaged, and the average was used in the background data set. This averaging of duplicates was used in other TEAD investigations (refer to Section 2.6.1.1 of the *Revised Final RI Addendum for OUs 4, 8, and 9* (Rust E&I 1997), and Section 2.7.1 of the *Phase II RFI Report For Known-Releases SWMUs* (Rust E&I 1995)).

The statistical evaluation of the background data set is diagrammed in Figure 2-12. Detections of metals and cyanide were statistically evaluated to calculate an upper bound background concentration for each particular analyte. The threshold background concentration was estimated by modifying the tolerance interval calculation procedures outlined in USEPA guidance for statistical analysis of groundwater monitoring data (USEPA 1989d).

A tolerance interval statistical analysis was run on all analytes that met the following two criteria: (1) analyte values within the data set were detected at a frequency greater than or equal to 85 percent and (2) the data set for a given analyte passed the Shapiro-Wilks test (W test) for normality. The W test is a statistical method designed for use with small data

Table 2-3. Summary of Analytes (Metals and Cyanide) Detected in the TEAD Soil Background Data Set

Analytes	BKS-92-01 (0 ft)	BKB-92-01 (3 ft)	BKS-92-02 (0 ft)	BKB-92-02 (2 ft)	BKS-92-03† (0 ft)	BKB-92-03† (3 ft)	BKS-92-04 (0 ft)	BKB-92-04 (3 ft)	BKS-93-05 (0.5 ft)	BKB-93-05 (3.5 ft)
Aluminum	26,000	32,000	22,000	11,000	(5500)	(2700)	19,000	9,900	8,630	4,380
Antimony	(LT[a] 34 *)	(LT 34 *)	(LT 34 *)	(LT 34 *)	(LT 34 *)	(LT 3.42)	(LT 34 *)	(LT 34 *)	(LT 0.3)	(LT 0.3)
Arsenic	(LT 120 *)	(LT 240 *)	(LT 120 *)	(LT 48 *)	(63.2)	(LT 240 *)	(LT 72 *)	(LT 240 *)	5.18	LT 2.5
Barium	190	270	190	100	(49)	(46)	160	99	75.9	64.6
Beryllium	LT 0.078	(LT 0.23 *)	LT 0.078	LT 0.078	(LT 0.078)	(LT 0.078)	LT 0.078	LT 0.078	LT 0.427	LT 0.427
Cadmium	LT 0.424	(LT 1.3 *)	LT 0.424	LT 0.424	(LT 0.424)	(LT 0.424)	LT 0.424	LT 0.424	LT 1.2	LT 1.2
Calcium	32,000	79,000	38,000	37,000	(11000)	(56000)	21,000	37,000	3,540	41,800
Chromium	12.6	19	16.5	13.5	(6.06)	(5.18)	13.2	9.33	10.1	6.09
Cobalt	LT 1.42	LT 1.42	LT 1.42	LT 1.42	(LT 1.42)	(LT 1.42)	LT 1.42	LT 1.42	4.16	4.4
Copper	12.7	13	29	10.7	(14.4)	(LT 1.95)	11.9	5.77	12.2	6.37
Cyanide	(LT 5)	(LT 5)	(LT 5)	(LT 5)	((LT 5))	((LT 5))	(LT 5)	(LT 5)	(NT[b])	(NT)
Iron	20,000	26,000	17,000	11,000	(7500)	(3400)	16,000	11,000	12,000	10,000
Lead	17	22	62	0.786	(160)	(6)	16	7.7	17.1	6.46
Magnesium	15,000	18,000	11,000	5,300	(3200)	(3900)	11,000	5,600	3,080	8,230
Manganese	610	600	660	270	(270)	(59)	520	220	234	171
Mercury	0.0374	LT 0.0259	LT 0.0259	LT 0.0259	(LT 0.0259)	(LT 0.0259)	LT 0.0259	LT 0.0259	LT 0.05	0.0572
Nickel	LT 2.46	(LT 7.5 *)	LT 2.46	LT 2.46	(LT 2.46)	(LT 2.46)	LT 2.46	LT 2.46	7.72	9.1
Potassium	(7100‡)	(8200‡)	(6800‡)	(2800‡)	(1300)	(600)	(5000‡)	(2400‡)	2210	913
Selenium	(LT 5100 *)	(LT 5100 *)	(LT 510 *)	(LT 510 *)	(LT 510 *)	(LT 510 *)	(LT 510 *)	(LT 510 *)	LT 0.449	LT 0.449
Silver	0.212	0.0788	0.121	0.0658	(0.66)	(0.0242)	0.0687	0.0421	LT 0.803	LT 0.803
Sodium	(NT)	(NT)	(NT)	(NT)	(NT)	(NT)	(NT)	(NT)	100	209
Thallium	(LT 83 *)	(LT 170 *)	(LT 83 *)	(LT 170 *)	(LT 170 *)	(LT 170 *)	(LT 170 *)	(LT 170 *)	LT 34.3	LT 34.3
Vanadium	14.8	28	17.1	13.7	(6.72)	(LT 1.34)	21	10.8	13.3	10.5
Zinc	85	70	84	40	(210)	(LT 7.96)	54	26.9	33	18.3

Table 2-3. Summary of Analytes (Metals and Cyanide) Detected in the TEAD Soil Background Data Set (continued)

Analytes	SB-BK-001 (0 ft)	SB-BK-001 (3 ft)	SB-BK-002 (0 ft)	SB-BK-002 (2 ft)	SB-BK-003 (0 ft)	SB-BK-003 (2 ft)	SB-BK-004 (0 ft)	SB-BK-004(D)[c] (0 ft)	SB-BK-004 (3 ft)	SB-BK-005 (0 ft)	SB-BK-005 (3 ft)	SB-BK-006 (10 ft)
Aluminum	9,510	2,280	8,910	2,590	13,200	12,100	17,100	15,700	10,900	6,550	4,460	3,310
Antimony	LT 7.14	LT 7.14	LT 7.14	LT 7.14	LT 7.14	LT 7.14	LT 7.14	LT 7.14	LT 7.14	LT 7.14	LT 7.14	15
Arsenic	4.04	3.22	6.05	5.76	24	19	6.55	6.66	6.86	19	16	6.5
Barium	92.6	36.7	86	38.7	188	157	169	166	147	92.2	64.9	45.3
Beryllium	1.21	0.633	1.2	LT 0.5	1.35	1.26	1.53	1.38	1.29	0.638	0.838	LT 0.5
Cadmium	LT 0.7	LT 0.7	0.814	LT 0.7	0.847	LT 0.7	LT 0.7	LT 0.7	LT 0.7	LT 0.7	LT 0.7	LT 0.7
Calcium	2,580	9,060	3,160	18,900	38,200	34,600	47,100	47,300	28,000	36,800	69,000	170,000
Chromium	10.4	LT 4.05	11.9	6.85	15.6	14.4	19.5	18.7	15.2	9.87	10.3	7.55
Cobalt	3.98	2.08	4.07	2.15	5.39	4.06	6.87	7.01	5.66	2.57	2.67	2.36
Copper	9.34	3.36	17.8	6.51	23.1	15.9	15	14.6	11.3	10.4	4.83	5.6
Cyanide	(LT 0.92)	(LT 0.92)	(LT 0.92)	(LT 0.92)	(LT 0.92)	NT	(LT 0.92)	NT	(LT 0.92)	(LT 0.92)	NT	NT
Iron	10,200	4,450	10,200	4,790	12,900	10,900	16,300	15,400	13,300	7,040	6,770	5,580
Lead	8.5	4.36	32.5	5.74	55.5	32.7	12	15	10.9	30.5	10.7	6.05
Magnesium	3,760	1,330	4,070	2,160	10,100	7,800	11,400	11,100	6,950	5,620	9,990	35,600
Manganese	273	85.1	232	84.8	458	370	477	456	376	195	140	449
Mercury	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05
Nickel	9.73	4.35	9.26	5.14	13.1	11.2	17.9	16.9	14.2	7.19	8.14	11.8
Potassium	2,720	541	3,070	781	4,570	3,830	5,670	5,200	2,320	2,300	1,620	801
Selenium	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	(LT 0.25)	LT 0.25	LT 0.25	(LT 0.25)
Silver	LT 0.589	LT 0.589	0.634	LT 0.589	0.66	LT 0.589	LT 0.589	LT 0.589	LT 0.589	LT 0.589	LT 0.589	LT 0.589
Sodium	225	193	243	189	343	323	463	498	1790	272	683	830
Thallium	LT 6.62	LT 6.62	LT 6.62	LT 6.62	9.6	LT 6.62	LT 6.62	LT 6.62	LT 6.62	LT 6.62	LT 6.62	11.7
Vanadium	15.1	8.48	15.9	9.4	20.5	19.4	27.7	25.9	23.8	13.1	23.1	15.9
Zinc	39.6	13.8	54.1	18	107	76.2	65.1	61.7	53.8	59.4	26.9	23.3

Note. — All values in μg/g (equal to ppm).
Note.— Values in parentheses were not included in summary statistics for TEAD Background
*='K' Flagging Code, not included in estimation of background statistics.
†=Samples BKS-92-03 and BKB-92-03 were thought to be collected in an area of surface contamination. These two samples were replaced with BKS-93-05 and BKB-93-05
‡=Method '99', not included in estimation of background statistics.
[a]Analyte concentration is less than Certified Reporting Limit.
[b]Not Tested.
[c]Duplicate analysis; values for the duplicate pair were averaged in estimating background statistics.

Table 2-4. TEAD Background Soil Sample Statistics for Anions (0-2 foot depth)

Analyte	Detects/ No. Samples	Minimum	Maximum	Arithmetic Mean	Arithmetic Std. Deviation	Upper Bound Concentration (UBC)	Distribution Type
Bromide	0/6	< 5	< 8.83	–	–	8.8	No Detects
Chloride	0/13	< 6.05	< 39.6	–	–	39.6	No Detects
Fluoride	0/6	—	6.36	–	–	6.36	No Detects
Nitrate/Nitrite	9/13	< 0.6	2.15	—	—	2.15	< 85% detects
Nitrate	2/6	< 3.36	9.45	–	–	9.45	< 85% detects
Nitrite	0/6	< 3.16	–	–	–	3.16	No Detects
Phosphate	0/6	ND[a] 5.0	–	–	–	5.0	No Detects
Total Phosphate	10/10	130	560	316.0	125.45	566.9	Normal
Sulfate	3/19	< 5	466.0	–	–	466.0	< 85% detects

Note.—Units in micrograms per gram. Upper Bound Concentration represents arithmetic mean + 2 arithmetic standard deviations. For analytes with no detects, UBC represents highest CRL.

[a]ND = not detected.

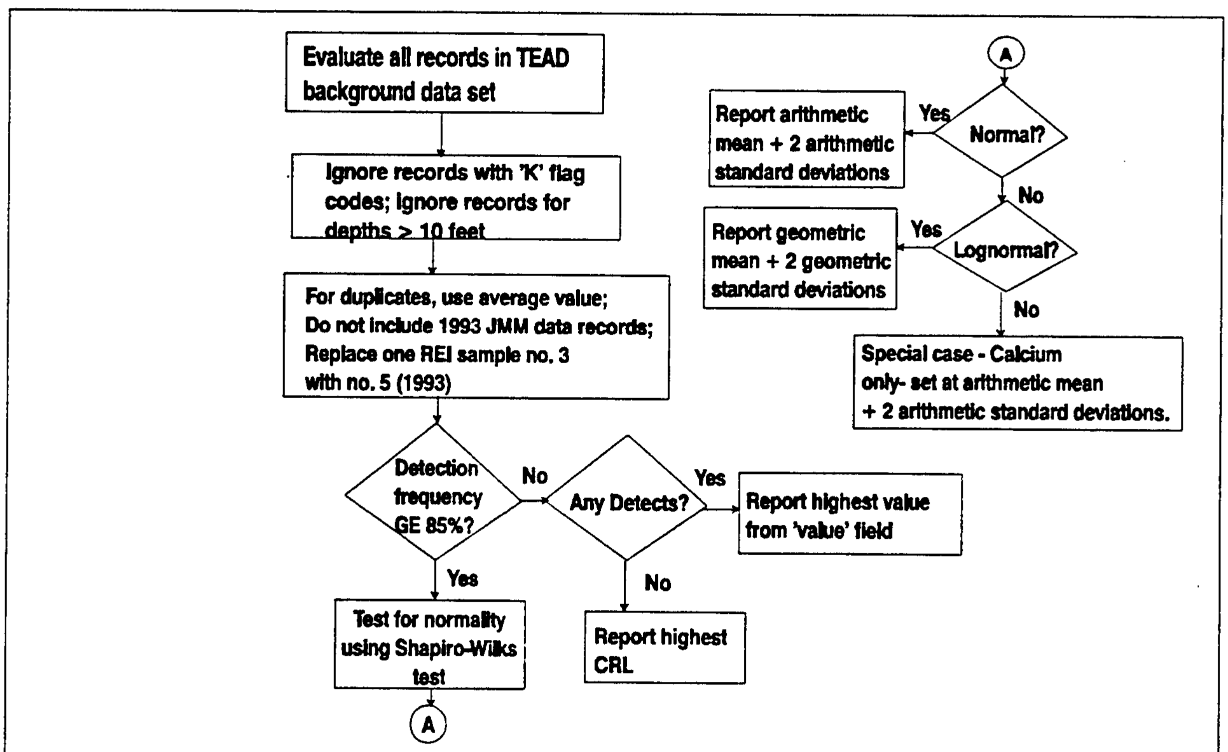

Figure 2-12. TEAD Background Evaluation Flow Diagram

populations and determines whether or not the values from a sample population are normally distributed. Any data point that was below the CRL (a non-detect), and was part of a data population that had a detection frequency greater than or equal to 85 percent, was still used in the W test and was assigned a value equal to one-half the CRL. USEPA guidance (USEPA 1989e) indicates that the use of a one-sided tolerance limit containing 95 percent of the population with a probability (confidence) of 0.95 is acceptable as the upper bound background concentration. The calculation of the tolerance limit is the mean plus k-standard deviations. K is a parameter based on the sample size. A sample size of 65 results in a calculation of the upper-bound background concentration as: the mean plus 2 standard deviations. Because the sample size for the TEAD background data set is much smaller than 65, strict application of the calculation would result in an even higher determination of background concentration (mean plus approximately 2.5 standard deviations). Thus, the use of mean plus 2 standard deviations is conservative.

If the sample population was determined to be normally distributed (i.e., the data passed the W test), the upper bound concentration (UBC) was set at the arithmetic mean plus two arithmetic standard deviations. If the data failed the test for normality, the data were transformed by taking the natural log of each value and a lognormal W test was run. If the data met the criteria for lognormal distribution, the UBC was calculated as the geometric mean plus two times the geometric standard deviation.

Where the detection frequency was less than 85 percent and there were detectable concentrations, the highest detected concentration was used as the UBC and no statistical analysis was performed.

If the specific analyte was not detected in any of the background samples within the data set, the highest CRL was used as the UBC.

Calcium had to be treated as a special case. There were greater than 85 percent detections, but the data were neither normally nor lognormally distributed. In this case, a mean and standard deviation were calculated, and the data were treated as if they were normally distributed.

Table 2-5 provides the summary statistics for the background concentrations of metals and cyanide detected in TEAD soils. Table 2-4 presents the summary statistics for anion data for the TEAD background soil samples from 0 to 2 feet. A UBC was not calculated for pH for comparison against background; as a result, pH was considered a COPC at only those SWMUs where pH analysis was requested, but addressed qualitatively due to the lack of toxicity data. The UBC represents a concentration below which detections can be assumed to belong to the background or naturally occurring distribution for the analyte. Investigative samples with concentrations above the background threshold value indicate the possibility of soil contamination.

The method used to calculate the UBCs results in numbers that are very conservative. This could result in identifying, as potential contamination, samples that are the result of naturally

Table 2-5. TEAD Background Soil Sample Statistics

Analyte	Detection Frequency, Detections/ Samples	Minimum ($\mu g/g$)[a]	Maximum ($\mu g/g$)	Arithmetic or Geometric Mean ($\mu g/g$)	Arithmetic or Geometric Standard Deviation ($\mu g/g$)	Upper Bound Concentration ($\mu g/g$)	Distribution Type
Silver (Ag)	8/19	0.0421	0.66			0.66	< 85% Hits[b]
Aluminum (Al)	19/19	2,280	32,000	11,743	8,170	28,083	Normal[c]
Arsenic (As)	12/13	<2.5	24	7.1	2.3	11.7	Lognormal[d]
Barium (Ba)	19/19	36.7	270	119	64	247	Normal
Beryllium (Be)	9/18	<0.078	1.455			1.46	< 85% Hits
Calcium (Ca)	19/19	2,580	170,000	39,307	37,588	114,483	Special Case[e]
Cadmium (Cd)	2/18	<0.424	0.847			0.847	< 85% Hits
Cobalt (Co)	13/19	<1.42	6.94			6.94	< 85% Hits
Chromium (Cr)	18/19	<4.05	19.1	11.8	4.4	20.6	Normal
Copper (Cu)	19/19	3.36	29	11.8	6.5	24.7	Normal
Cyanide	0/14	<0.92	5			5	No Hits[f]
Iron (Fe)	19/19	4,450	26,000	11,841	5,445	22,731	Normal
Mercury (Hg)	2/19	<0.0259	0.0572			0.057	< 85% Hits
Potassium (K)	13/13	541	5,435	2,393	1,528	5,449	Normal
Magnesium (Mg)	19/19	1,330	35,600	7,057	2.16	7,061	Lognormal
Manganese (Mn)	19/19	84.8	660	338	180	698	Normal
Sodium (Na)	13/13	100	1,790	333	2.13	337	Lognormal
Nickel (Ni)	13/18	2.46	17.4			17.4	< 85% Hits
Lead (Pb)	19/19	0.786	62	12.67	2.78	18.2	Lognormal
Antimony (Sb)	1/11	<7.14	15			15	< 85% Hits[g]
Selenium (Se)	0/11	<0.25	0.449			0.449	No Hits
Thallium (Tl)	2/13	<6.62	11.7			11.7	< 85% Hits
Vanadium (V)	19/19	8.48	28	16.9	5.75	28.4	Normal
Zinc (Zn)	19/19	13.8	107	49.8	26.5	103	Normal

[a]Micrograms per gram.
[b]Where detection frequency was <85%, but there were detects, UBC=highest reported concentration.
[c]Normal distribution of sample population.
[d]Lognormal distribution of sample population.
[e]Although Ca data distribution was neither normal nor lognormal, normal distribution assumed.
[illegible]here analyte was not detected in any sample, minimum and maximum values=[illegible]ratory CRLs, and UBCs = maximum CRL.
[illegible]ith a single detection, minimum value = CRL, maximum = reported value, a[illegible]UBC = reported value.

occurring processes. Studies of natural background concentrations of metals in Utah give distributions that are higher than the values calculated for TEAD (Dragun and Chiasson 1991).

2.2.1.3 *Relation of TEAD Background Concentrations to Soil Type*

As part of the Phase II RFI report for the Group A Suspected Releases SWMUs, Montgomery Watson prepared a discussion of the relation of the concentrations determined for background analytes to the various soil types found on TEAD (Montgomery Watson 1996). The conclusion was that coarse-grained soils across the depot were not statistically different and could be combined as one population. The report also concluded that, based on small differences in the mean concentrations, the fine-grained soils should be treated as two populations, an eastern and a western one. The differences were found in the mean concentrations for arsenic, barium, chromium, lead, thallium, and zinc. No statistical differences were found between surface and subsurface soils.

The analysis, based on very small sample numbers, indicates that there is not a significant difference in background concentrations of analytes among the soil types identified at TEAD.

2.2.2 Chemicals of Potential Concern Screening Process

The screening process for the TEAD COPCs followed the recommended USEPA guidance shown in Figure 2-13 (USEPA 1994c). Due to the complexity of this process, a more detailed flow chart is provided in Figure 2-14, which shows the steps used to extract the relevant data from the U.S. Army's IRDMIS database. The screening process was divided into two areas: (1) soil and sediment data and (2) surface water data. Well and sewer data are not applicable to this SWERA. Section 2.2.2.2 addresses the surface water screening approach.

2.2.2.1 *Soil and Sediment Data*

The COPC screening was limited to all surface-soil and sediment data collected by all of the TEAD contractors present on the IRDMIS database in the Fall of 1994 (except for SAIC Group C SWMUs as discussed previously in Section 2.1.3.4). These data can be found as follows: Section 2.7.12 of the *Revised Final Phase II RFI Report for Known-Releases SWMUs* (Rust E&I 1995); Section 2.6.1.1 of Appendices H and I to the *Revised Final RI Addendum Report for OUs 4, 8, and 9* (Rust E&I 1997); Tables 5-2, 5-3, 5-4, 5-5, 5-6, 5-7, 6-2, 6-3, 6-4, 6-5, 9-2, 13-2, 13-3, and 13-4 of the *Final Phase II RFI Report For Group B Suspected-Releases SWMUs* (SAIC 1996); Appendix O to the *Revised Final RFI Report for Group A Suspected-Releases* SWMUs (Montgomery Watson 1996); and Appendices M and O to the *Revised Final Phase II RFI Report for Known-Releases SWMUs* (Rust E&I 1995).

The database represented samples collected from 1986 through September 1994. Database records that represented unknowns and QC samples—such as duplicates, matrix spikes and

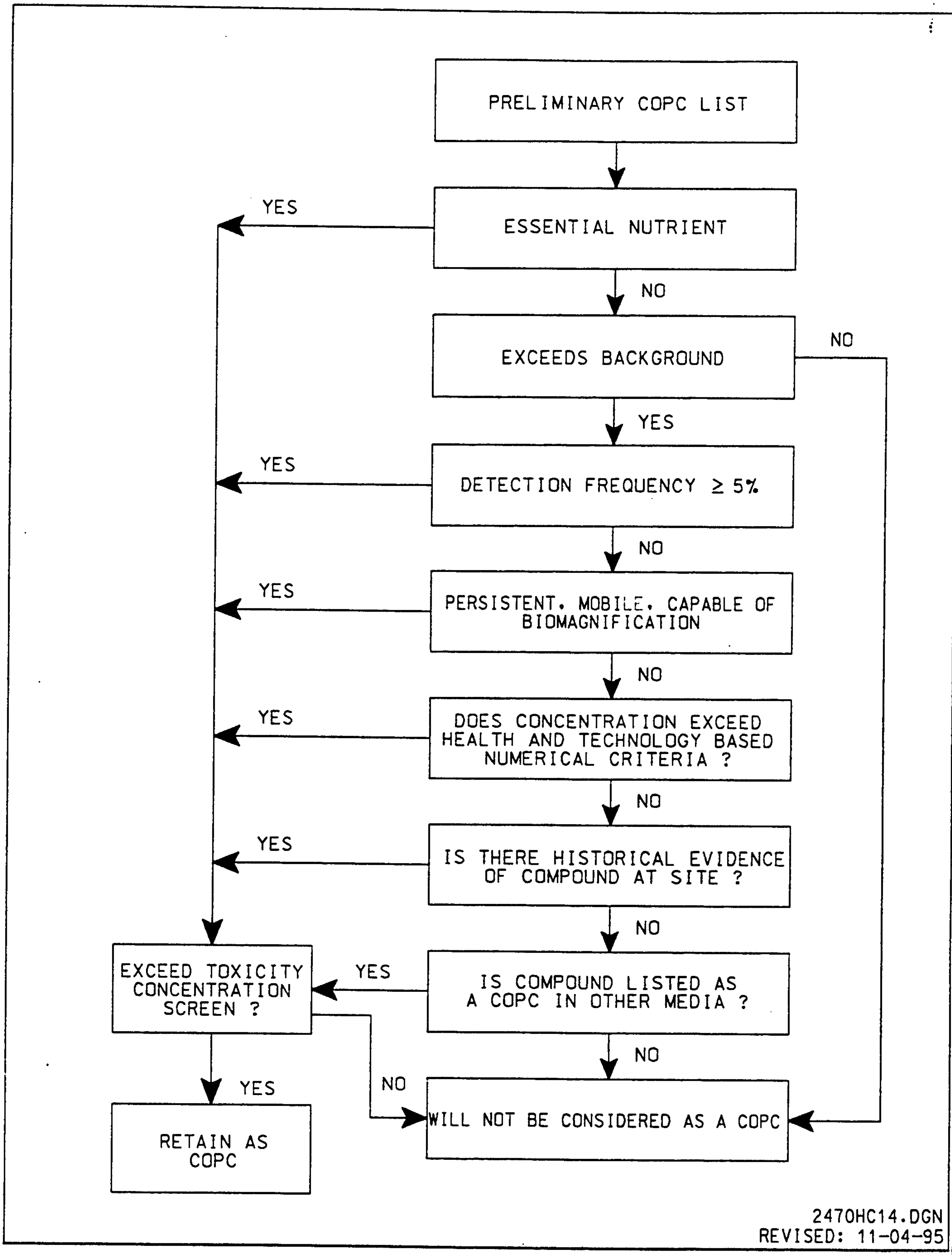

Figure 2-13. COPC Screening Diagram (USEPA 1994)

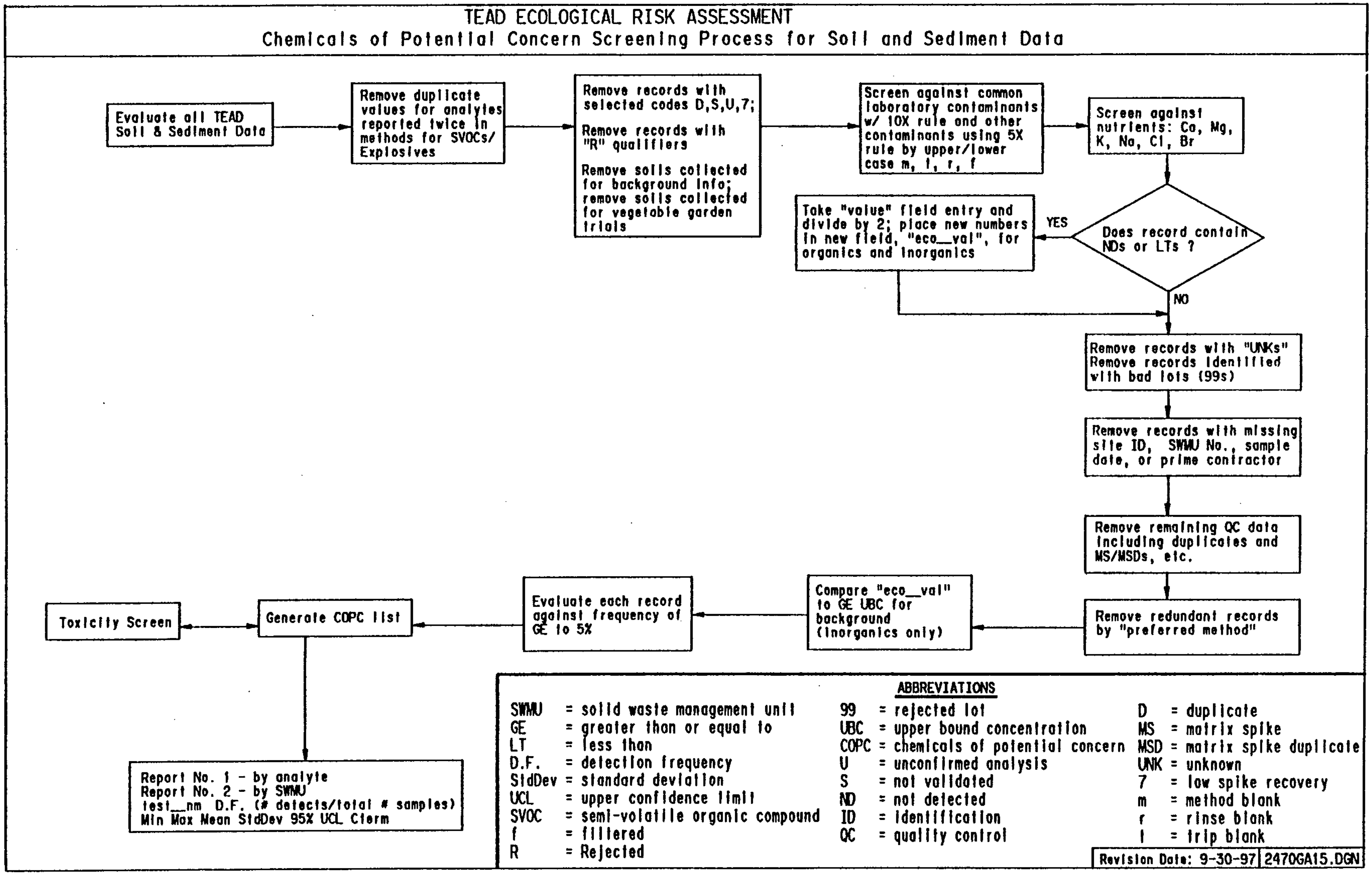

Figure 2-14. COPC Screening Process Flow Chart for Soil and Sediment Data

matrix spike duplicates, blanks, and samples collected for the TEAD background—were not included. No data collected from the RSA were included. Composite soil samples collected for the Task 0003 RI vegetable garden were also omitted. Data with data qualifier codes containing "R" for rejected, "S" for not validated, "U" for unconfirmed analysis or "99" (lot rejected by the USAEC Chemistry Branch) were not included. All other data qualifier and flagging code records were included. The data set was then screened against common laboratory contaminants using the recommended USEPA guidance (*Risk Assessment Guidance for Superfund, Part A*, 1989b). Due to the size of the resultant database and the lack of consistency between laboratories and contractors, Rust E&I conducted the screening against common laboratory contaminants for only those sample records that could be linked to the corresponding QC record for trip, field, method, and equipment rinse blanks. The list of common laboratory contaminants included acetone, methylene chloride, diethyl phthalate, dimethyl phthalate, di-n-octyl phthalate, di-n-butyl phthalate, toluene, and methyl ethyl ketone.

Records containing common nutrients and selected anions (Ca, Mg, K, Na, Cl, and Br) were removed, as well as those records for which a key field was missing, such as site identification, SWMU number, sample date, or prime contractor. An analyte may be reported by more than one method in the IRDMIS database although that analyte is not typically analyzed for by that method. In particular, this situation applies to several analytes reported by some combination of explosives, pesticides, PCBs, volatile, and semivolatile methods. This results in a large number of redundant data records that would bias the screening process for detection frequency. It was therefore necessary to evaluate the redundant records and include only those values reported by the customarily accepted method (e.g., use explosive detection limits rather than semi-volatile detection limits for compounds commonly reported as explosives). Further definition of the database, as data were refined, was possible in July 1996. This resulted in over 20,000 additional records being added to the database. The resultant database contained approximately 124,000 records.

If a data record contained an "ND" (non detect) or an "LT" (less than), the CRL was divided by 2 and placed in the data field, eco_val, to represent the subsequent value against which records would be further screened against background and detection frequency. All positive detects were also included in the eco_val field, which thus contained all records retained for further screening. Using guidance provided in a telephone conference with USEPA Region VIII toxicologists, Dr. Gerry Henningsen and Dr. Mark Wickstrom (Henningsen and Wickstrom 1994), the soil depths were limited to those values between 0 and 2 feet (soils at depths greater than 2 feet were considered to be beyond plant root zones and animal burrows). The *inorganic* records were then compared to ≥ (greater than or equal to, GE) the "upper bound concentration", UBC, in the TEAD background data set (for inorganics only) as shown in Tables 2-4 and 2-5. The entire valid record set (including organics and inorganics) for a particular analyte was then evaluated against a detection frequency of ≥ 5 percent and included in the summary statistics if it met this condition. Data that failed to meet this criterion were excluded. Summary statistics, based on the normal distribution, including minimums, maximums, means, standard deviations, and the 95% upper confidence limit (UCL95), were calculated on all the remaining eco_val field data. The Cterm, which is equivalent to an

exposure point concentration (EPC), was calculated as the lesser of the UCL95 or the maximum detected value. If there was only one sample collected, that sample value was used to represent the Cterm.

A Cterm was calculated for every COPC at each of the TEAD SWMUs included in the SWERA.

A list of 53 COPCs was generated on an analyte basis (Preliminary COPC List) for TEAD (Table 2-6). Another list of 118 COPCs was generated on a SWMU basis (Interim Final COPC List) (Table 2-7). Although the lists were generated from the same data set, they differ due to the manner in which the detection frequency was calculated. In Table 2-6, the detection frequency was calculated as the number of detects for each contaminant divided by the total number of samples collected *site-wide* for each contaminant. In Table 2-7, the detection frequency was calculated as the number of detects of each contaminant divided by the number of samples collected for each contaminant at each SWMU. This SWMU-by-SWMU list was further expanded to a total of 124 COPCs after the 1996 review and clarification of the TEAD database.

In early October 1997, Rust E&I recently re-examined the TEAD historical database used for COPC screening as part of their documentation of project files. Records with database fields containing "WASS" (i.e., solid waste), "SUMP", "TANK" and "DRUM" were also removed from consideration. A new set of summary statistics has since been calculated, and 4-methyl phenol (4MP) and diethyl phthalate (DEP) are no longer COPCs since they were below the 5% detection frequency. The number of COPCs was reduced from 124 to 122 and are presented in the revised final COPC list (Table 2-8).

Refer to Appendix B for the *TEAD COPC Screen Summary Statistics-Soils and Sediments* (Preliminary COPC List by analyte, Revised Final COPC list by SWMU). Summary statistics for the TEAD historic soil and sediment data by SWMU (Revised Final COPC List) provide the basis for the direct soil ingestion and direct contact exposure pathways. The summary statistics are based upon the underlying assumption that the individual analyte populations are normally distributed. To proceed with the MDL studies and remain on schedule, Rust E&I proposed on behalf of TEAD to use the COPC list generated on an analyte basis (Preliminary COPC List) for the biota analyses (Rust E&I 1995b). The output of the Revised Final COPC List was subsequently used to generate Cterm concentrations based upon the UCL95, which were used in the quantitative risk assessment. The resulting COPCs were then evaluated for toxicity, persistence, tendency to bioaccumulate, and mobility. Except where noted by "----", and except for thallium, the analytes listed in the Preliminary COPC List (see Table 2-6) were those included in the biota analyses. COPCs were grouped together for risk assessment purposes in order to combine similar compounds by chemical class, and to calculate HIs (Section 7.4.2). The chemical classes included in the COPC grouping are shown in Table 2-9.

Table 2-6. Preliminary List of Chemicals of Potential Concern (COPCs) by Analyte

COPC Analyte (Sorted by Analyte and ≥ 5% detects)	COPCs Analyzed in Biota
2,4,6-Trinitrotoluene (246TNT)	2,4,6-Trinitrotoluene
2,4-Dichlorophenoxacetic acid (24D)	2,4-Dichlorophenoxacetic acid
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (678HPD)	As per SW-846 Method 8290
1,2,3,4,6,7,8-Heptachlorodibenzofuran (678HPF)	As per SW-846 Method 8290
1,2,3,7,8-Hexachlorodibenzo-p-dioxin (678HXD)	As per SW-846 Method 8290
1,2,3,6,7,8-Hexachlorodibenzofuran (678HXF)	As per SW-846 Method 8290
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (789HXD)	As per SW-846 Method 8290
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (78HXDD)	As per SW-846 Method 8290
Silver (AG)	Silver
Aluminum (AL)	Aluminum
Arsenic (AS)	Arsenic
Bis(2-Ethylhexyl) Phthalate (B2EHP)	———
Barium (BA)	Barium
Benzo(a) Anthracene (BAANTR)	Benzo(a) Anthracene
Benzo(k) Fluoranthene (BKFANT)	Benzo(k) Fluoranthene
Trichlorofluoromethane (CCL3F)	———
Cadmium (CD)	Cadmium
Chrysene (CHRY)	Chrysene
Cobalt (CO)	Cobalt
Chromium (CR)	Chromium
Hexavalent Chromium (CRHEX)	———
Copper (CU)	Copper
Fluoranthene (FANT)	Fluoranthene
Iron (FE)	Iron
Mercury (HG)	Mercury
Manganese (MN)	Manganese
Nickel (NI)	Nickel
Nitrite, Nitrate-Nonspecific (NIT)	———
Nitrate (NO3)	———
Octachlorodibenzodioxin (OCDD)	As per SW-846 Method 8290
Octachlorodibenzofuran (OCDF)	As per SW-846 Method 8290
Lead (PB)	Lead

Table 2-6. Preliminary List of Chemicals of Potential Concern (COPCs) by Analyte (continued)

COPC Analyte (Sorted by Analyte and ≥ 5% detects)	COPCs Analyzed in Biota
pH (PH)	——
Phenanthrene (PHANTR)	Phenanthrene
Phosphate (PO4)	——
2,2-Bis(Para-chlorophenyl)-1,1-Dichloroethene (PPDDE)	PPDDE
2,2-Bis(Para-chlorophenyl)-1,1,1-Trichloroethane (PPDDT)	PPDDT
Pyrene (PYR)	Pyrene
Cyclotrimethylenetrinitramine (RDX)	RDX
Antimony (SB)	Antimony
2,3,7,8-Tetrachlorodibenzodioxin (TCDD)	TCDD
Total Hexachlorodibenzo-p-dioxins (THCDD)	As per SW-846 Method 8290
Total Hexachlorodibenzofurans (THCDF)	As per SW-846 Method 8290
Total Heptachlorodibenzo-p-dioxins (THPCDD)	As per SW-846 Method 8290
Total Heptachlorodibenzofurans (THPCDF)	As per SW-846 Method 8290
Total Pentachlorodibenzo-p-dioxins (TPCDD)	As per SW-846 Method 8290
Total Pentachlorodibenzofurans (TPCDF)	As per SW-846 Method 8290
Total Petroleum Hydrocarbons (TPHC)	——
Total Phosphates (TPO4)	——
Total Tetrachlorodibenzo-p-dioxins (TTCDD)	As per SW-846 Method 8290
Total Tetrachlorodibenzofurans (TTCDF)	As per SW-846 Method 8290
Vanadium (V)	Vanadium
Zinc (ZN)	Zinc

Note.—Hatched line (——) indicates the analyte was not analyzed for in biota tissue.

Table 2-7. Interim Final List of Chemicals of Potential Concern (COPCs)

Analyte Code	Analyte
111TCE	1,1,1-Trichloroethane
12DCLB	1,2-Dichlorobenzene
135TNB	1,3,5-Trinitrobenzene
13DCLB	1,3-Dichlorobenzene
13DMB	m-Xylene
14DCLB	1,4-Dichlorobenzene
234HXF	2,3,4,6,7,8-Hexachlorodibenzofuran
234PCF	2,3,4,7,8-Pentachlorodibenzofuran
246TNT	2,4,6-Trinitrotoluene
24D	2,4-D/ 2,4-Dichlorophenoxyacetic acid
24DNT	2,4-Dinitrotoluene
2MNAP	2-Methylnaphthalene
4MP	p-Cresol
678HPD	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
678HPF	1,2,3,4,6,7,8-Heptachlorodibenzofuran
678HXD	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
678HXF	1,2,3,6,7,8-Hexachlorodibenzofuran
789HPF	1,2,3,4,7,8,9-Heptachlorodibenzofuran
789HXD	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
78HXDD	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
78HXDF	1,2,3,4,7,8-Hexachlorodibenzofuran
78PCDD	1,2,3,7,8-Pentachlorodibenzo-p-dioxin
78PCDF	1,2,3,7,8-Pentachlorodibenzofuran
ACET	Acetone
ACLDAN	alpha-Chlordane
AENSLF	Endosulfan I
AG	Silver
AL	Aluminum
ANAPNE	Acenaphthene
ANTRC	Anthracene
AS	Arsenic
B2EHP	Bis(2-ethylhexyl) phthalate
BA	Barium
BAANTR	Benzo(a)anthracene
BAPYR	Benzo(a)pyrene
BBFANT	Benzo(b)fluoranthene
BBZP	Butylbenzyl phthalate
BE	Beryllium
BGHIPY	Benzo(ghi)perylene
BKFANT	Benzo(k)fluoranthene
BZALC	Benzyl alcohol
CCL3F	Trichlorofluoromethane
CD	Cadmium
CH3CL	Chloromethane
CHCL3	Chloroform
CHRY	Chrysene
CLDAN	Chlordane
CO	Cobalt
CR	Chromium
CRHEX	Hexavalent chromium

Table 2-7. Interim Final List of Chemicals of Potential Concern (COPCs) (continued)

Analyte Code	Analyte
CU	Copper
CYN	Cyanide
DBAHA	Dibenz(ah)anthracene
DBZFUR	Dibenzofuran
DCLB	Dichlorobenzene - nonspecific
DEP	Diethyl phthalate
DLDRN	Dieldrin
DMP	Dimethyl phthalate
DNBP	Di-n-butyl phthalate
ENDRN	Endrin
ENDRNA	Endrin aldehyde
ETC6H5	Ethylbenzene
F	Fluoride
FANT	Fluoranthene
FE	Iron
FLRENE	Fluorene
GCLDAN	gamma-Chlordane
HG	Mercury
HMX	Cyclotetramethylenetetranitramine
HPCL	Heptachlor
HPCLE	Heptachlor epoxide
ICDPYR	Indeno(1,2,3-c,d)pyrene
LIN	Lindane
MEC6H5	Toluene
MN	Manganese
NAP	Naphthalene
NB	Nitrobenzene
NI	Nickel
NIT	Nitrite, nitrate - nonspecific
NNDPA	N-Nitrosodiphenylamine
NO2	Nitrite
NO3	Nitrate
OCDD	Octachlorodibenzodioxin - nonspecific
OCDF	Octachlorodibenzofuran - nonspecific
PB	Lead
PCB248	PCB 1248
PCB254	PCB 1254
PETN	PETN / Pentaerythritol tetranitrate
PH	pH
PHANTR	Phenanthrene
PHENOL	Phenol
PO4	Phosphate
PPDDD	ppDDD
PPDDE	2,2-Bis(p-chlorophenyl)-1,1-dichloroethene
PPDDT	2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane
PYR	Pyrene
RDX	RDX / Cyclonite
SB	Antimony
SE	Selenium
SO4	Sulfate
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin

Table 2-7. Interim Final List of Chemicals of Potential Concern (COPCs) (continued)

Analyte Code	Analyte
TCDF	2,3,7,8-Tetrachlorodibenzofuran
TCLEE	Tetrachloroethylene
THCDD	Total hexachlorodibenzo-p-dioxins
THCDF	Total hexachlorodibenzofurans
THPCDD	Total heptachlorodibenzo-p-dioxins
THPCDF	Total heptachlorodibenzofurans
TL	Thallium
TPCDD	Total pentachlorodibenzo-p-dioxins
TPCDF	Total pentachlorodibenzofurans
TPHC	Total petroleum hydrocarbons
TPO4	Total phosphates
TRCLE	Trichloroethylene
TTCDD	Total tetrachlorodibenzo-p-dioxins
TTCDF	Total tetrachlorodibenzofurans
V	Vanadium
XYLEN	Xylenes
ZN	Zinc

Table 2-8. Revised Final List of Chemicals of Potential Concern

ANALYTE CODE	ANALYTE	GROUP
111TCE	1,1,1-Trichloroethane	VOC-R
12DCLB	1,2-Dichlorobenzene	DCB
135TNB	1,3,5-Trinitrobenzene	135TNB
13DCLB	1,3-Dichlorobenzene	DCB
13DMB	m-Xylene	VOC-R
14DCLB	1,4-Dichlorobenzene	DCB
234HXF	2,3,4,6,7,8-Hexachlorodibenzofuran	DIOXIN_FURAN
234PCF	2,3,4,7,8-Pentachlorodibenzofuran	DIOXIN_FURAN
246TNT	2,4,6-Trinitrotoluene	246TNT
24D	2,4-D / 2,4-Dichlorophenoxyacetic acid	24D
24DNT	2,4-Dinitrotoluene	DN_TOL
2MNAP	2-Methylnaphthalene	PAH
678HPD	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	DIOXIN_FURAN
678HPF	1,2,3,4,6,7,8-Heptachlorodibenzofuran	DIOXIN_FURAN
678HXD	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	DIOXIN_FURAN
678HXF	1,2,3,6,7,8-Hexachlorodibenzofuran	DIOXIN_FURAN
789HPF	1,2,3,4,7,8,9-Heptachlorodibenzofuran	DIOXIN_FURAN
789HXD	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	DIOXIN_FURAN
78HXDD	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	DIOXIN_FURAN
78HXDF	1,2,3,4,7,8-Hexachlorodibenzofuran	DIOXIN_FURAN
78PCDD	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	DIOXIN_FURAN
78PCDF	1,2,3,7,8-Pentachlorodibenzofuran	DIOXIN_FURAN
ACET	Acetone	VOC-R
ACLDAN	alpha-Chlordane	CLDN
AG	Silver	AG
AL	Aluminum	AL
ANAPNE	Acenaphthene	PAH
ANTRC	Anthracene	PAH
AS	Arsenic	AS
B2EHP	Bis(2-ethylhexyl) phthalate	PHTLAT
BA	Barium	BA
BAANTR	Benzo[a]anthracene	PAH
BAPYR	Benzo[a]pyrene	PAH
BBFANT	Benzo[b]fluoranthene	PAH
BBZP	Butylbenzyl phthalate	PHTLAT
BE	Beryllium	BE
BENSLF	Endosulfan II	ENDOSULFAN
BGHIPY	Benzo[ghi]perylene	PAH
BKFANT	Benzo[k]fluoranthene	PAH
BZALC	Benzyl alcohol	BZALC
C14A	Myristic acid	C14A
C15A	Pentadecanoic acid	C15A
C16A	Palmitic acid	C16A
C6H6	Benzene	VOC
CCL3F	Trichlorofluoromethane	VOC-R
CD	Cadmium	CD
CH3CL	Chloromethane	VOC-R
CHCL3	Chloroform	VOC-R
CHRY	Chrysene	PAH
CLDAN	Chlordane	CLDN
CO	Cobalt	CO
CR	Chromium	CR_CRHEX
CRHEX	Hexavalent chromium	CR_CRHEX
CU	Copper	CU
CYN	Cyanide	ANION
DBAHA	Dibenzo[ah]anthracene	PAH
DBZFUR	Dibenzofuran	QUAL
DCLB	Dichlorobenzene - nonspecific	DCB
DLDRN	Dieldrin	A_D
DMP	Dimethyl phthalate	PHTLAT
DNBP	Di-n-butyl phthalate	PHTLAT

Table 2-8. Revised Final List of Chemicals of Potential Concern (continued)

ANALYTE CODE	ANALYTE	GROUP
DNOP	Di-n-octyl phthalate	PHTLAT
ENDRN	Endrin	E_I
ENDRNA	Endrin aldehyde	E_I
ETC6H5	Ethylbenzene	VOC-R
F	Fluoride	ANION
FANT	Fluoranthene	PAH
FE	Iron	FE
FLRENE	Fluorene	PAH
GCLDAN	gamma-Chlordane	CLDN
HG	Mercury	HG
HMX	Cyclotetramethylenetetranitramine	HMX
HPCL	Heptachlor	H_HE
HPCLE	Heptachlor epoxide	H_HE
ICDPYR	Indeno[1,2,3-C,D]pyrene	PAH
LIN	Lindane	LIN
MEC6H5	Toluene	VOC-R
MN	Manganese	MN
NAP	Naphthalene	PAH
NB	Nitrobenzene	NB
NI	Nickel	NI
NIT	Nitrite, nitrate - nonspecific	ANION
NNDPA	N-Nitrosodiphenylamine	NNDPA
NO2	Nitrite	ANION
NO3	Nitrate	ANION
OCDD	Octachlorodibenzodioxin - nonspecific	DIOXIN_FURAN
OCDF	Octachlorodibenzofuran - nonspecific	DIOXIN_FURAN
PB	Lead	PB
PCB248	PCB 1248	PCB_S
PCB254	PCB 1254	PCB_S
PCB260	PCB 1260	PCB_S
PETN	PETN / Pentaerythritol tetranitrate	QUAL
PH	pH	ANION
PHANTR	Phenanthrene	PAH
PHENOL	Phenol	PHENOL
PO4	Phosphate	ANION
PPDDD	ppDDD	DDT_R
PPDDE	2,2-Bis(p-chlorophenyl)-1,1-dichloroethene	DDT_R
PPDDT	2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane	DDT_R
PYR	Pyrene	PAH
RDX	RDX / Cyclonite	RDX
SB	Antimony	SB
SE	Selenium	SE
SO4	Sulfate	ANION
TCDD	2,3,7,8-Tetrachlorodibenzodioxin	DIOXIN_FURAN
TCDF	2,3,7,8-Tetrachlorodibenzofuran	DIOXIN_FURAN
TCLEE	Tetrachloroethylene	VOC-R
THCDD	Total hexachlorodibenzo-p-dioxins	DIOXIN_FURAN
THCDF	Total hexachlorodibenzofurans	DIOXIN_FURAN
THPCDD	Total heptachlorodibenzo-p-dioxins	DIOXIN_FURAN
THPCDF	Total heptachlorodibenzofurans	DIOXIN_FURAN
TL	Thallium	TL
TPCDD	Total pentachlorodibenzo-p-dioxins	DIOXIN_FURAN
TPCDF	Total pentachlorodibenzofurans	DIOXIN_FURAN
TPHC	Total petroleum hydrocarbons	TPHC
TPO4	Total phosphates	ANION
TRCLE	Trichloroethylene	VOC-R
TTCDD	Total tetrachlorodibenzo-p-dioxins	DIOXIN_FURAN
TTCDF	Total tetrachlorodibenzofurans	DIOXIN_FURAN
V	Vanadium	V
XYLEN	Xylenes	VOC-R
ZN	Zinc	ZN

Table 2-9. Revised Final Chemicals of Potential Concern by Group

Group	COPCs Included	Comment
135TNB	1,3,5-Trinitrobenzene	
246TNT	2,4,6-Trinitrotoluene	
24D	2,4-Dichlorophenoxyacetic acid	
A_D	Aldrin, dieldrin	Aldrin is not a final COPC
AG	Silver	
AL	Aluminum	
ANION	SO4 (sulfate), PO4 (phosphate), TPO4 (total phosphate), CYN (cyanide), NIT (nitrate, nitrite, nonspecific), NO2 (nitrite), NO3 (nitrate), and pH	All removed as quantitative COPCs
AS	Arsenic	
BA	Barium	
BE	Beryllium	
BZALC	Benzyl alcohol	
CD	Cadmium	
CLDN	Gamma chlordane, alpha chlordane, chlordane	
CO	Cobalt	
CR_CRHEX	Chromium, hexavalent chromium	
CU	Copper	
DCB	1,2-Dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, dichlorobenzene (nonspecific)	
DDT_R	p,p'-DDT, p,p'-DDE, p,p'-DDD	
DIOXIN_FURAN	All dioxins, all furans	789HXF (1,2,3,7,8,9-hexachlorodibenzofuran) is not a final COPC
DN_TOL	2,4-Dinitrotoluene, 2,6-dinitrotoluene	2,6-dinitrotoluene is not a final COPC
E_I	Endrin, isodrin, endrin aldehyde, endrin ketone	Isodrin and endrin ketone are not final COPCs
ENDOSULFAN	Endosulfan I, endosulfan II, endosulfan sulfate	Endosulfan I (alpha-endosulfan) and endosulfan sulfate are not final COPCs
FE	Iron	
H_HE	Heptachlor, heptachlor epoxide	
HG	Mercury	
HMX	HMX (cyclotetramethylenetetranitramine)	
LIN	Lindane (gamma-benzene hexachloride)	Also called gamma-BHC
MN	Manganese	

Table 2-9. Revised Final Chemicals of Potential Concern by Group (continued)

Group	COPCs Included	Comment
NB	Nitrobenzene	
NI	Nickel	
NNDPA	N-Nitrosodiphenylamine	
PAH	All polynuclear aromatic hydrocarbons (PAHs) on final COPC list	
PB	Lead	
PCB_S	PCB 1248, PCB 1254, PCB 1260	Known as polychlorinated biphenyls (PCBs) or aroclors
PHENOL	Phenol	
PHTLAT	All phthalates on Revised Final COPC list	diethyl phthalate is not a final COPC
QUAL	Dibenzofuran, PETN (pentaerythritol tetranitrate)	Discussed qualitatively
RDX	RDX (cyclonite)	
SB	Antimony	
SE	Selenium	
TL	Thallium	
TPHC	Total petroleum hydrocarbons (TPH)	
VOC/VOC-R	All VOCs (volatile organic compounds) on Revised Final COPC List	All VOCs are removed from quantitative risk assessment
V	Vanadium	
ZN	Zinc	

Note.—C14A (myristic acid), C15A (pentadecanoic acid), and C16A (palmitic acid) were included in July 1996 COPC screen but were found at SWMU 52 and are not included in the SWERA.

2.2.2.2 *Surface Water Data*

The amount of surface water data at TEAD was limited, and the screening approach was similar to the approach used for soil and sediment data with a few differences:

- Surface water data were not screened against common laboratory contaminants because a link between samples and blanks was not apparent.
- Data were not evaluated for detection frequency.
- Data were not compared to background (not applicable).
- Filtered and unfiltered data were included.

Approximately 2,000 records were retained for risk assessment purposes. The resulting COPCs were then evaluated in the toxicity screen for toxicity, persistence, tendency to bioaccumulate, and mobility. Figure 2-15 represents the approach to the screening of TEAD surface water data.

2.2.2.3 *Final COPC Selection Process*

A meeting with the ETAG was held on April 26, 1995, at TEAD. At the meeting, the following topics were discussed and the approaches agreed upon:

- The process for evaluating the TEAD background used in the COPC screening process
- The process for screening the IRDMIS database for soil and sediment data for COPCs
- The results of the COPC screening process (Preliminary and Interim Final COPC Lists)
- Selection of COPCs and matrices for biota analysis
- The aquatic model to be used for the Sewage Lagoons (SWMU 14), including the addition of ducklings to the receptor list
- The terrestrial model to be used for soil and dietary ingestion of COPCs for key receptors.

2.2.2.3.1 ***Toxicity Benchmark Value Selection.*** At the April 26, 1995 meeting, it was agreed to consolidate COPCs where appropriate. One possible approach would be the utilization of representative toxicity benchmark values for chemical classes. A letter on behalf of TEAD (July 11, 1995) was submitted to the attendees of that ETAG meeting, summarizing the meeting minutes. Shortly thereafter, Rust E&I drafted a letter on behalf of TEAD (July 20, 1995) to the USAEC, USEPA, and the State of Utah, presenting an approach to consolidate the list of COPCs. A conference call was held on July 20, 1995, with USEPA, Rust E&I, and TEAD to discuss the approach outlined in that letter (USEPA 1995b). Minutes of that conference call were submitted on behalf of TEAD (August 7, 1995) to the USAEC, USEPA, and the State of Utah. Following input from the regulatory community, and further efforts by Rust E&I, the COPC list was modified. Following additional discussions between the USEPA, the State of Utah, the USAEC, and Rust E&I, uncertainty factors were agreed upon for derivation of final toxicity benchmark values. The agreed-upon strategy for the

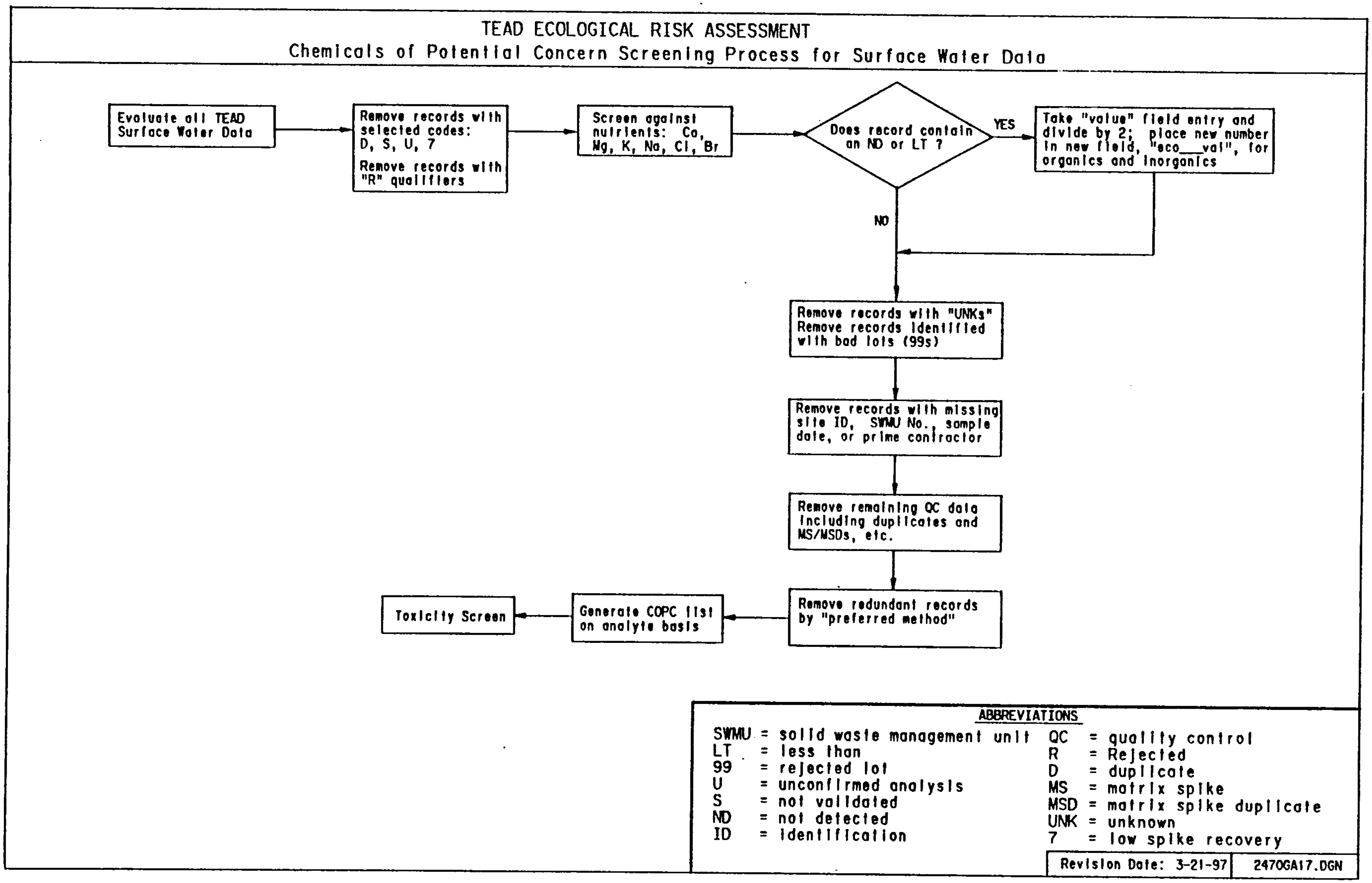

Figure 2-15. COPC Screening Process Flow Chart—Surface Water Data

incorporation of UFs is summarized in Section 7.3, Toxicity Assessment, Table 7-22. Final TBVs and COPC decisions were as follows:

1. TBVs for benzo(a)pyrene (BAP/BAPYR), which represent the most toxic of the PAHs for mammals, plants, and soil fauna were used, with appropriate uncertainty factors, to represent all of the polynuclear aromatic hydrocarbons (PAHs). No TBV was available for avian species.

2. Toxicity data were not available for hexavalent chromium (Cr^{+6}) for terrestrial wildlife in the literature reviewed. Use of a total chromium value was acceptable. It was acknowledged that chromium is rarely found in the hexavalent state in dry soil.

3. The toxicity data provided by the USEPA for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) to represent each of the dioxin and furan compounds were reviewed. A no observed adverse effects level (NOAEL) of 100 pg/g/day was used and converted to a corresponding TBV of $1x10^{-4}$ mg/kg for avian species. A NOAEL of 1 pg/g/day was converted to $1x10^{-6}$ mg/kg and used to represent mammalian species. Toxicity equivalency factors (TEFs) from EPA/625/3-80/016 (USEPA 1989f) were applied to the TBVs to reflect relative toxicity for the various dioxins and furans (Table 7-26, Section 7.3).

4. For bis-2-ethylhexyl phthalate, TBVs of 102 mg/kg bw/day for mammals and 10.2 mg/kg-bw/day for birds were utilized. These values were used to represent other phthalates for which toxicity values were unavailable. Uncertainty factors were applied as appropriate.

5. A TBV for 1,2-dichlorobenzene was used to represent all dichlorobenzene COPCs.

6. A TBV for alpha-chlordane was used to represent chlordane, alpha chlordane and gamma chlordane.

7. A review of cyanide data (Eisler 1991) indicated that cyanide is unlikely to persist in soil or bioaccumulate. No anions were quantitatively evaluated in the risk assessment as discussed in Section 2.2.2.3.2. Nitrate/nitrite acts as a fertilizer in most soils. Other anions were compared to the TEAD background.

8. The TBV for PCB Aroclor 1254 was used to represent all other PCBs.

9. The TBV for endrin was also used to represent endrin aldehyde.

10. The toxicity value for p,p-DDT was also used to represent p,p,-DDE and p,p-DDD.

11. In a fax dated 7/24/95, the USEPA (USEPA 1995c) provided Rust E&I with toxicity data for phenol based upon rats. No toxicity data for avian species were located.

12. Only acute, oral LD_{50} data for birds and rats/mice were obtained for benzyl alcohol. This information was provided by the USEPA (USEPA 1995c).

13. A chronic, oral lowest observed adverse effect level (LOAEL) in mice based upon inhalation was used for nitrobenzene. This information was provided by the USEPA (USEPA 1995c).

14. It was agreed to address dibenzofuran, which is not a chlorinated furan, in a qualitative manner.

15. It was agreed to use the TBV for heptachlor to represent heptachlor epoxide as well.

16. Rust E&I agreed to contact USACHPPM for toxicity information pertaining to pentaerythritol tetranitrate (PETN). No toxicity data were available.

17. The USEPA (USEPA 1995c) provided Rust E&I with information regarding n-nitrosodiphenylamine. However, the data were based upon tumor formation, which is limited as an endpoint for ecological risk. No chronic, oral study data were available.

The complete, detailed TBV toxicity tables for avian and mammal species, and plants and soil fauna are located in Section 7.3.

2.2.2.3.2 *Evaluation of Anions Relative to TEAD Background.* Following USEPA guidance (USEPA 1995b), anions that were COPCs based upon the COPC screening process were evaluated relative to TEAD background. Table 2-4 in Section 2.2.1.1 presents the TEAD background soil statistics for anions. With the exception of fluoride, no TBVs were available for the remaining anions. Therefore, quantitative risk assessment could not be accomplished for those remaining COPCs. Data for chloride and bromide were available for the TEAD background data set; however, these two anions were removed along with the nutrients (calcium, magnesium, potassium and sodium). Table 2-10 includes anions based on the Interim Final and Revised Final COPC lists which were removed from the Revised Final COPC list.

2.2.2.3.3 *Evaluation of Volatile Solvents as COPCs.* For volatile solvents where no toxicity data were available, the USEPA suggested that the remaining amount in the soil should be calculated based upon the soil half-lives. As presented in Table 2-11, values have been calculated for residual concentrations of these 11 solvents based upon soil half-lives taken from Howard (1991). Assumptions for these calculations include: degradation rate is uniform over time; half-life may increase if soil surface is sealed with relatively impermeable material; and half-life depends on soil conditions such as moisture content, depth of contaminant, organic matter content, microbial populations, and atmospheric conditions.

Table 2-10. Comparison of Anions and pH in TEAD SWMUs (Historical Data) vs TEAD Background

Analyte	SWMU[a]	Minimum/ Maximum ($\mu g/g$)[b]	Detects/Total No. of Samples and Detection Frequency (%)	TEAD[c] UBC [d]	Comment
Fluoride	7	9.6/11.3	1/3 = 33.3	6.36	COPC[e] on basis of DF[f];no HQs[g]>1; recommend removing as COPC.
Cyanide	4	9.69	1/1=100	5 (0 detects)	In Maintenance area; no ecological habitat; no TBV[h] available at time of COPC screening; recommend removing as COPC.
	22	17.5	1/1=100	5 (0 detects)	TBV unavailable at time of COPC screening; review of Eisler (1991) data obtained at later date and detection frequencies resulted in recommendation for removal as COPC;
	23	13/41.1	2/2=100	5 (0 detects)	TBV unavailable at time of COPC screening; review of Eisler (1991) data obtained at later date and detection frequencies resulted in recommendation for removal as COPC;
	29	55	1/1=100	5 (0 detects)	TBV unavailable at time of COPC screening; review of Eisler (1991) data obtained at later date and detection frequencies resulted in recommendation for removal as COPC;
Nitrate/Nitrite	1	2.42/380	18/18=100	2.15	No TBV; explosives as a possible precursor are already evaluated; typically bound with metals; toxicity based on metals which are already evaluated; acts as a fertilizer in low concentrations; recommend removing as COPC.
	14	130	1/1=100	2.15	No TBV; recommend removal as a COPC.
Nitrite	22	4.37	1/1=100	3.16	Cleanup possible for other COPCs; acts as a fertilizer; no TBV.
Nitrate	6	1.6/11.4	6/9=66.7	9.45	Recommend removing as a COPC; acts as a fertilizer; no TBV.

Table 2-10. Comparison of Anions and pH in TEAD SWMUs (Historical Data) vs TEAD Background (continued)

Analyte	SWMU[a]	Minimum/ Maximum (μg/g)[b]	Detects/Total No. of Samples and Detection Frequency (%)	TEAD[c] UBC [d]	Comment
Nitrate, cont.	23	1.68/28	6/11=54.6	9.45	Recommend removing as COPC; acts as a fertilizer; no TBV.
	35	1.68/23	8/9=88.9	9.45	Recommend removing as COPC; BRAC[f] parcel; acts as a fertilizer; no TBV.
	40	1.68/11.2	7/11=63.6	9.45	Recommend removing as COPC; acts as a fertilizer; no TBV.
Total phosphates	1	75/2200	75/78=96.1	567	No TBV; recommend removing as COPC; acts as a fertilizer.
	14	3.74/6500	2/4=50	567	No TBV; recommend removing as COPC; acts as a fertilizer.
	19	150/1200	12/12=100	567	No TBV; recommend removing as COPC; acts as a fertilizer; NFA recommended in RFI.
	21	150/2000	9/10=90	567	No TBV; recommend removing as COPC; acts as a fertilizer.
	37	160/580	12/12/=100	567	No TBV; recommend removing as COPC; acts as a fertilizer.
Phosphate	6	2.5/20.4	8/11=72.7	5	No TBV; recommend removing as COPC; acts as a fertilizer. typically bound with metals; toxicity based on metals which are already evaluated.
	23	2.5/92.8	2/9=22.2	5	No TBV; recommend removing as COPC; acts as a fertilizer. typically bound with metals; toxicity based on metals which are already evaluated.
	35	2.5/25.2	7/9=77.8	5	No TBV; recommend removing as COPC; acts as a fertilizer; typically bound with metals; toxicity based on metals which are already evaluated; BRAC parcel.

Table 2-10. Comparison of Anions and pH in TEAD SWMUs (Historical Data) vs TEAD Background (continued)

Analyte	SWMU[a]	Minimum/ Maximum (µg/g)[b]	Detects/Total No. of Samples and Detection Frequency (%)	TEAD[c] UBC [d]	Comment
Phosphate, cont.	36	2.5/21.5	4/9=44.4	5	No TBV; recommend removing as COPC; acts as a fertilizer; typically bound with metals; toxicity based on metals which are already evaluated.
Sulfate	35	7.2/900	2/7=28.6	466	No TBV; recommend removing as COPC.
pH	1/1d	4.64/9.57	76/76=100	NA	Recommend removing as COPC; below TEAD UBC but passed on COPC based on DF; pHs are within acceptable environmental range.
	14	6.97/8.23	4/4=100	NA	Recommend removing as COPC; below TEAD UBC but passed on COPC based on DF; pHs are within acceptable environmental range.
	19	7.16/9.4	12/12=100	NA	Recommend removing as COPC; below TEAD UBC but passed on COPC based on DF; pHs are within acceptable environmental range.
	21	7.59/9.06	10/10=100	NA	Recommend removing as COPC; below TEAD UBC but passed on COPC based on DF; pHs are within acceptable environmental range.
	24	7.0	1/1=100	NA	Recommend removing as COPC; below TEAD UBC but passed on COPC based on DF; pHs are within acceptable environmental range.
	25	7.7/8.7	10/10=100	NA	Recommend removing as COPC; below TEAD UBC but passed on COPC based on DF; pHs are within acceptable environmental range.

Table 2-10. Comparison of Anions and pH in TEAD SWMUs (Historical Data) vs TEAD Background (continued)

Analyte	SWMU[a]	Minimum/ Maximum ($\mu g/g$)[b]	Detects/Total No. of Samples and Detection Frequency (%)	TEAD[c] UBC [d]	Comment
pH, cont.	37	7.92/9.32	12/12=100	NA	Recommend removing as COPC; below TEAD UBC but passed on COPC based on DF; pHs are within acceptable environmental range.

[a]Solid waste management units.
[b]Micrograms per gram, equivalent to parts per million.
[c]Tooele Army Depot.
[d]Upper bound concentration.
[e]Contaminants of potential concern.
[f]Detection frequency.
[g]Hazard quotients.
[h]Toxicity benchmark value.
[i]Base Realignment and Closure.

Table 2-11. Residual Solvent Concentrations Based Upon Soil Half-Lives

Analyte	C_0 Cterm[a] µg/g[b] (Location of max. detect)	C_t (high) µg/g	C_t (low) µg/g	Half-life Range (high) days	(low) days	Detected in SWMUs	Overall Detection Frequency in SWMUs with Detects (% Detection)
1,1,1-Trichloroethane	0.243 (SWMU 47)	0.109	0.051	273	140	13, 47	2/24 (8.3%)
Acetone	0.041 (SMWU 28)	1E-15	6E-97	7	1	28	1/8 (12.5%)
Trichlorofluoro-methane	0.137 (SWMU 15)	0.075	0.042	365	183	1/1d, 4, 15, 19, 20, 26, 38	18/152 (11.8%)
Chloromethane	0.520 (SWMU 13)	2E-04	2E-14	28	7	13	1/15 (6.7%)
Chloroform	0.104 (SWMU 4)	0.030	0.017	180	120	4	1/18 (5.6%)
Ethylbenzene	0.574 (SWMU 52)	2E-10	1E-32	10	3	20, 21, 52	17/46 (37%)
Toluene	11.327 (SWMU 52)	6E-04	2E-23	22	4	1/1d, 4, 20, 21, 30, 45, 47, 52	36/159 (22.6%)
Tetrachloroethylene	0.001 (SWMU 1/1d)	5E-04	3E-04	365	183	1/1d	2/9 (22.2%)
Trichloroethylene	0.966 (SWMU 15)	0.53	0.29	365	183	15, 41	10/47 (21.3%)
Xylenes	4.956 (SWMU 52)	2E-03	1E-13	28	7	20, 21, 37,52	22/57 (38.6%)
Meta-xylene	4.566 (SWMU 52)	2E-03	1E-13	28	7	47, 52	13/32 (40.6%)

Note.—Time and analyte concentration since field measure based upon time from sampling to COPC screening, which typically equals 315 days. These data resulted from the output of COPC screening for soil and sediment data (Interim Final COPC List by SWMU).
C_0=Cterm value for highest values found in any SWERA SWMU.
C_t (high)=Calculated concentration for COPC when screened based on highest referenced half-life.
C_t(low)=Calculated concentration for COPC when screened based on lowest referenced half-life.
$C_t=C_0e^{-kt}$
Where $k = \frac{0.693}{\text{half life}}$ and t = elapsed time from sampling to COPC screening.

[a]Concentration term.
[b]Micrograms per gram.
[c]Half-life of solvent = amount of time for 1/2 of the organic compound to dissipate from soil. High and low values which define a range are taken from Howard, Philip H., Editor, *Handbook of Environmental Degradation Rates*, Lewis Publishers, Inc., 1991.
[d]Solid Waste Management Unit.

All calculations indicate little residual solvent in the SWMU soils, and the following 11 solvents are not considered to be an ecological risk:

- 1,1,1-Trichloroethane (IRDMIS analyte code is 111TCE)—This solvent was detected in 1 of 15 samples taken at SWMU 13 (Tire Disposal Area) and in 1 of 9 soil/sediment samples from SWMU 47 (Boiler Blowdown Area). The maximum value was detected in sediments taken from the outfall of an oil/water separator at the Boiler Blowdown Area. Analyses of samples taken downstream from the separator did not contain reportable quantities of 111TCE. Operations of the boiler facility are monitored to minimize release of contaminants. The solvent 111TCE was found in a single surface soil sample at the Tire Disposal Area, which is an open, essentially unused site; hence, additional contamination is unlikely. Normal degradation of the solvent from its surface locations will have reduced the concentration to levels protective of ecological receptors.

- Acetone—It was detected in SWMU 28, the 90 Day Drum Storage Area, and in only one surface soil sample of eight taken from that area. Because of the low value determined for acetone, it was reasoned that it may have been a laboratory contaminant (Montgomery Watson 1993). In any event, because of the low half-life for degradation of acetone, (7 days maximum) remaining concentrations would now be extremely small.

- Trichlorofluoromethane—This volatile organic was detected in seven SWMUs: 1 (OB/OD Main Demolition Area), 4 (Sandblast Area), 15 (Sanitary Landfill), 19 (AED Demilitarization Test Facility), 20 (AED Deactivation Furnace Site), 26 (DRMO Storage Yard), and 38 (Industrial Wastewater Treatment Plant). Of these, only the Sandblast Area and the Sanitary Landfill reported detects in the range of 0.1 micrograms per gram of trichlorofluoromethane. At this concentration, and with a maximum half-life of 365 days, any remaining amounts of the compound would likely present little hazard to ecological receptors. Further, placement of a soil barrier over the landfill, and remediation of the sandblast areas will essentially eliminate the risk of ecological exposure to any remaining solvent. Concentration levels in the other SWMUs are an order of magnitude lower than those at SWMUs 4 and 15 and will logically have degraded by volatilization to levels considered protective of ecological receptors.

- Chloromethane—A single detect of chloromethane was reported out of 15 samples taken at SWMU 13 (Tire Disposal Area). It was not detected in any other SWMU. Because of the low degradation half life (28 days maximum) and the high probability that the occurrence at the remote, unused, Tire Disposal Area was a one-time event, chloromethane does not appear to be a potential risk to ecological receptors.

- Chloroform—It was only detected at SWMU 4 (Sandblast Area), and in only 1 sample of 18 analyzed. The combination of a low detection value (0.104 microgram/gram) and a maximum degradation half-life of 180 days results in the prospect of small residuals of chloroform, which would reasonably not be a risk to ecological receptors.

- Ethylbenzene—It was detected at SWMUs 20 (AED Deactivation Furnace Site), 21 (Deactivation Furnace Building 1320), and 52 (Possible Drain Field/Disposal Trenches). The detects at SWMUs 20 and 21 were presumably resultants of fuel or other oil spills in the past and are not a risk to ecological receptors because of low initial detect values and a low degradation half-life (10 days maximum). Significantly higher values of ethylbenzene were reported at SWMU 52 and are associated with a black material found across the Possible Drain Field site. It has been proposed that the VOCs detected in this material seem to be chemically bonded or physically retained and, thus, contained in an inert state (SAIC 1996b). As a result, and because eventual removal of the black material is anticipated in order to mitigate potential human health risks, this material is not likely to pose a risk to ecological receptors.

- Toluene—It was found in 8 SWMUs at a 23 percent detection rate (36 samples with toluene detects out of 159 samples taken). In seven of these SWMUs—1 (OB/OD Main Demolition Area), 4 (Sandblast Area), 20 (AED Deactivation Furnace Site), 21 (Deactivation Furnace Building 1320), 30 (Old IWL), 45 (Stormwater Discharge) and 47 Boiler Blowdown Areas)—the toluene is associated with previous industrial activities. It is not expected that additional contamination will occur, so that because of the very low degradation half-life of toluene (22 days maximum), any residual amounts will not present a risk to ecological receptors. In SWMU 52 (Possible Drain Field/Disposal Trenches), where the highest values of toluene were detected and associated with a black material at the site, it is conjectured that the VOC is chemically bonded or physically retained, and thus, contained in an inert state (SAIC 1996b). As a result, and because eventual removal of the black material is anticipated in order to mitigate potential human health risks, this material is not likely to pose a risk to ecological receptors.

- Tetrachloroethylene—Two detects of tetrachloroethylene out of nine samples taken at SWMU 1 (OB/OD Main Demolition Area) were reported with a Cterm value of 0.001 micrograms/gram. Because of this very low concentration level reported in 1994, and a degradation half-life of 365 days maximum, residual amounts of this material are not considered a risk to ecological receptors.

- Trichloroethylene—This material was detected in soil samples from two SWMUs: 15 (Sanitary Landfill) and 41 (Box Elder Wash Drum Site). The latter SWMU has been remediated and the Sanitary Landfill is projected to be covered by a soil barrier cap. As a result, ecological risk from this solvent should be negligible.

- Xylenes—Total xylenes were detected at SWMUs 20 (AED Deactivation Furnace Site), 21 (Deactivation Furnace Building 1320), 37 (Contaminated Waste Processor), and 52 (Possible Drain Field/Disposal Trenches). The detects at SWMUs 20, 21, and 37 were presumably resultants of nonrecurring fuel or other oil spills in the past, and logically are not a risk to ecological receptors because of low initial detect values and a low degradation half-life (28 days maximum). Significantly higher values of xylenes were reported at SWMU 52 and are associated with a black material found across the Possible Drain Field site. It has been proposed that the VOCs detected in this material seem to be chemically bonded or physically retained and, thus, contained in an inert state (SAIC 1996b). As a

result, and because eventual removal of the black material is anticipated in order to mitigate potential human health risks, this material should not be a risk to ecological receptors.

- Meta-xylene—This organic compound was also detected in the black material found at SWMU 52 (Possible Drain Field/Disposal Field). As noted, it is conjectured that the VOCs detected in the black material seem to be chemically bonded or physically retained and, thus, contained in an inert state (SAIC 1996b). As a result, and because eventual removal of the black material is anticipated in order to mitigate potential human health risks, meta-xylene should not be considered a risk to ecological receptors.

2.2.2.3.4 ***Final COPC Selection.*** Where toxicity data were available, quantitative risk calculations were performed on the basis of the list of 122 COPCs with the exception of pH, nitrate, nitrite, nitrate/nitrite-nonspecific, dibenzofuran, phosphates, sulfate, bromacil (surface water), PETN, and a number of volatile solvents (Table 2-12).

Table 2-12. Analytes on Revised Final COPC List for Which Quantitative Risk Assessment Was Not Performed

Analyte	Analyte Code	Reason for Removal
111-trichloroethane	111TCE	Too volatile to remain in soil
Acetone	ACET	Too volatile to remain in soil
Trichlorofluoromethane	CCL3F	Too volatile to remain in soil
Chloromethane	CH3CL	Too volatile to remain in soil
Chloroform	CHCL3	Too volatile to remain in soil
Ethylbenzene	ETC6H5	Too volatile to remain in soil
Toluene	MEC6H5	Too volatile to remain in soil
Tetrachloroethylene	TCLEE	Too volatile to remain in soil
Trichloroethylene	TRCLE	Too volatile to remain in soil
Xylenes	XYLEN	Too volatile to remain in soil
Anions including cyanide, pH	—	See Table 2-10
Dibenzofuran	DBZFUR	No toxicity data
Pentaerythritol tetranitrate	PETN	No toxicity data
Bromacil (surface water)	—	No toxicity data

All COPCs for which toxicity data were unavailable have been addressed qualitatively in terms of occurrence, range of concentrations, and future land use plans including records of decision and remediation. Figure 2-16 provides a process overview for obtaining a final COPC list.

As a result of this screening process and other investigative action at TEAD, several SWMUs and areas of concern were not fully evaluated in this SWERA. These SWMUs and reasons for removal from SWERA consideration are identified in Table 2-13.

2.2.3 Key Receptor Species Selection

Key ecological receptors are those species or taxa of plants and animals that have been selected as critical components for the SWERA. The following criteria were applied in order to select key receptors:

- Species that are threatened, endangered, or state sensitive
- Game animals or wildlife that have economic value
- Species that are likely to have a high COPC exposure capacity due to life history
- Species that are present at TEAD and are part of the food web
- Species that have significant biological or ecological relevance

If habitat for a species exists at TEAD and if the species fit the criteria listed above, then the species was included as a key receptor species. The key receptors were selected by considering all potential exposure pathways and master lists of plant and wildlife species (observed and potential) for the TEAD facility. To aid in the selection of key receptor species, information derived from previous in-field surveys was used to compile master lists of all species present at the TEAD facility. The TEAD species lists for vegetation and wildlife are shown in Tables 1-3 and 1-5, respectively. Included in these master lists are species that, while not physically observed, utilize habitats that exist at TEAD and could possibly be present at this facility.

A food web diagram (Figure 2-17), which depicts the major trophic level interactions and describes nutrient flow and transfer of matter and energy through these levels, was developed from the species lists and the exposure pathways. For purposes of this SWERA, the food web diagram was also used to portray potential routes of COPCs from the soil to biotic species at various trophic levels, with key receptor species being components of this food web.

Small mammals, whose home ranges are contained entirely on-site, have the potential to receive a proportionately greater exposure to COPCs than mammals and birds that spend only a fraction of their time on site throughout the year. Species that use the entire TEAD facility as their ecological community feed and forage in areas larger than a single SWMU (or pairs of SWMUs). This could either tend to increase potential cumulative effects of contaminants that are present at more than one SWMU or act to dilute the COPC intake rates due to feeding/foraging in non-contaminated areas. The size of foraging areas used by individuals of

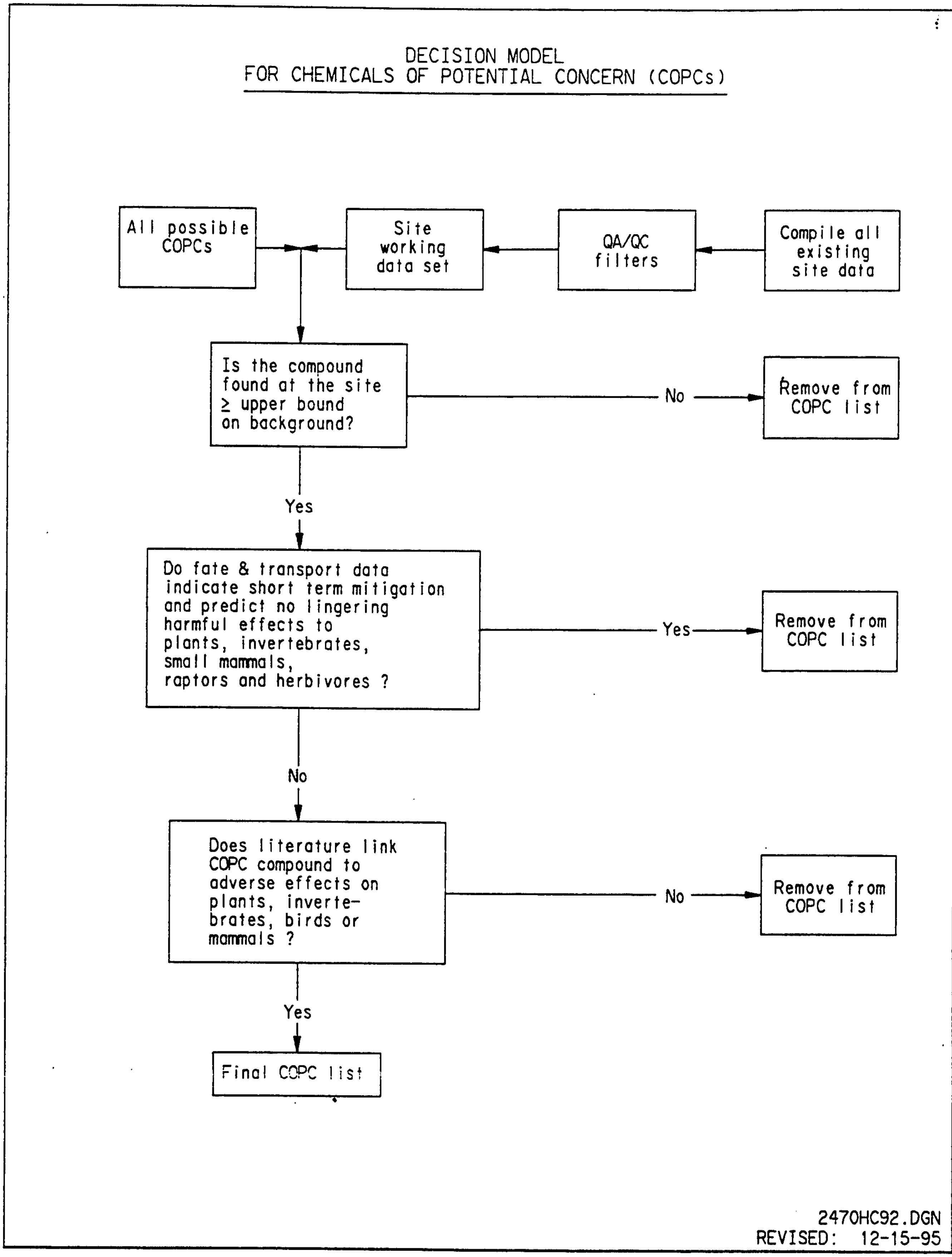

Figure 2-16. COPC Decision Model

Table 2-13. SWMUs Removed From Further SWERA Consideration Based Upon COPC Screen

SWMU	Description	Reason for Removal	Comments
2	Industrial Waste Lagoon (IWL)	IWL ponds and ditches were covered; no surface contamination.	Surface cleanup/closure complete. Groundwater cleanup underway. Decon pads closed and scheduled for removal.
5	Pole Transformer Polychlorinated Biphenyl (PCB) Spill	Clean soil cover remedial action complete. No contaminated ecological pathways remain.	Record of Decision (ROD) signed; remedial design and remedial action complete.
9	Drummed Radioactive Waste	No contamination found during Remedial Investigation (RI).	ROD signed. No Action necessary.
17	Former Transformer Storage	No contamination found during RI.	ROD signed. No Action necessary.
18	Radioactive Waste Storage Bldg. (S-659)	No ecological habitat (inside building).	ROD signed. Closure of building proceeding under Base Realignment and Closure (BRAC).
24	Battery Pit	All subsurface contamination below asphalt.	Contaminated areas provide no ecological habitat.
33	PCB Storage Bldg. 659	No ecological habitat (inside building).	ROD signed. Closure of building proceeding under BRAC.
39	Solvent Recovery Facility	No samples collected at this location.	No further action recommended.
41	Box Elder Wash Drum Site	Remedial action consisting of removal of drums and contaminated soil complete. No contaminated ecological pathways remain.	ROD signed; remedial design and remedial action complete.
43	Container Storage Area for P999	No samples collected at this location.	No further action recommended.
44	Tank Storage for Trichloroethylene (TCE)	No samples collected at this location.	No further action recommended.
48	Old Dispensary Discharge	No contamination found.	No further action recommended.
49	Stormwater/Industrial Wastewater Piping	No ecological habitat.	BRAC parcel Solid Waste Management Unit (SWMU).
50	Compressor Condensate Drain-Bldg. 619	No ecological habitat.	BRAC parcel SWMU.
51	Chromic Acid/Alodine Drying Beds	Limited ecological habitat in Maintenance area;	BRAC parcel SWMU.
52	Possible Drain Field-Disposal Trenches	Data unavailable at time of COPC[(a)] screen.	Qualitative evaluation. Remediation likely for human health protection will mitigate any ecological concern.
53	PCB Storage/Spill Sites	Limited ecological habitat in Maintenance area.	BRAC parcel SWMU.
54	Sandblast Areas	Limited ecological habitat in Maintenance area.	BRAC parcel SWMU.
55	Battery Shop-Building 618	Very limited ecological habitat in Maintenance area.	BRAC parcel SWMU.

Table 2-13. SWMUs Removed From Further SWERA Consideration Based Upon COPC Screen (continued)

SWMU	Description	Reason for Removal	Comments
56 - old AOC-1[b]	Gravel Pit	No data available at time of COPC screen.	Qualitative evaluation. Remediation likely for human health protection will mitigate any ecological concern.
57 - old AOC-2	Skeet Range	No data available at time of COPC screen.	Qualitative evaluation. Remediation likely for human health protection will mitigate any ecological concern.
AOC-3	Extraction Well 15	No data available at time of COPC screen. Subsequent investigation found no contamination.	No further action recommended.
AOC-4	Unknown site near Ammo Storage Area	No data available at time of COPC screen. Subsequent investigation found no contamination.	No further action recommended.

[a]Contaminant of potential concern.
[b]Area of concern.

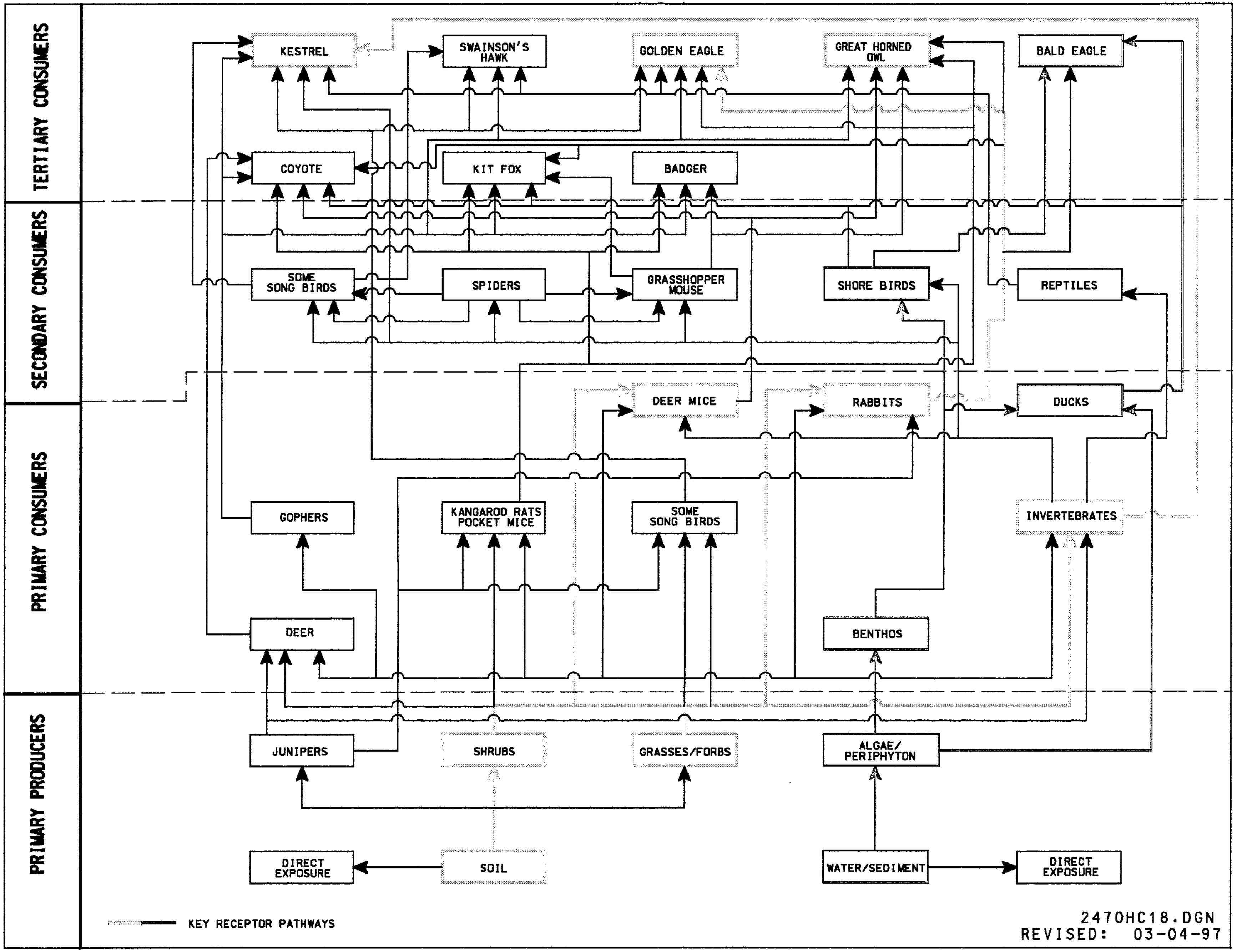

Figure 2-17. Food Web Diagram for TEAD

a key receptor population is crucial to the understanding of the effects of this contamination on an entire ecosystem or biotic community.

Species selected as key receptors are associated with major exposure and food chain pathways, have sufficiently-sized populations, and are representative of the greatest biomass in the food chain. Availability of toxicity information on the COPCs' effect on key receptor species was also considered. The intent of this initial evaluation was to evaluate a "worst case" scenario where the probabilities of identifying exposure and effects would be optimized.

Figure 2-9 in Section 2.1.1.1.3 provides an overall conceptual site model of exposure pathways. The following pathways were chosen as representative for sampling and modeling purposes, and show the relationships that exist between key ecological receptors:

1. Soil > Plants > Small Herbivores > Raptors/Carnivores
2. Soil > Plants > Large Herbivores > Raptors/Carnivores
3. Soil > Plants > Passerine Birds > Raptors
4. Soil > Plants > Invertebrates > Passerine Birds/Raptors
5. Soil > Plants > Invertebrates > Small Omnivore/Carnivore
6. Water/Sediment > Algae > Benthic Invertebrates > Shorebirds/Waterfowl/Ducklings > Bald Eagle
7. Surface Water > Large and Medium Herbivores > Raptors/Passerine Birds/Kit Fox

Figure 2-18 illustrates a food web representing the significant exposure pathways and trophic levels between TEAD terrestrial key receptors. Ideally, sampling should occur for each specific trophic level and each species to accurately assess possible exposure and effects. However, project constraints required selection of those key receptors and pathways that best represent the criteria described at the beginning of this section.

The biotic species listed in Table 2-14 were selected as key receptor species for the SWERA, with the indicator species that were used in risk assessment modeling identified in bold print. (Indicator species are wildlife or vegetation species that were selected for sampling/ laboratory analysis and/or ecological modeling to determine the presence or absence of COPCs. This information, in turn, is used for modeling COPC concentrations to upper trophic level key receptors).

The ESAs, as described in Section 2.2.4, are characterized by vegetation communities and animal species common to a semi-arid, cold desert region. The biota has adapted to the environmental factors of this type of habitat, and the region is inhabited by a large variety of animal species. These species may occur as permanent residents, temporary or seasonal residents, or migratory transients. The threatened, endangered, or sensitive species on TEAD or in the vicinity of the site are not likely to be dependent on or affected by the COPCs because they only temporarily reside at the ESAs. The reason for the temporary residence includes such factors as migratory habits of waterfowl and seasonal changes in home ranges.

Indicator species are potential threatened, endangered, and candidate species of concern at TEAD, and observed species that could make up a significant portion of the diet of a species at a higher trophic level. These species are considered to be key ecological receptors and are identified as assessment endpoints. Information on potential threatened, endangered, and candidate species of concern as well as other species at TEAD was obtained during conversations and through correspondence with the U.S. Fish and Wildlife Service, the Utah Division of Wildlife Resources, the Utah Natural Heritage Program, the Bureau of Land Management, and through observation by the Environmental Management Division at TEAD. Based on observations or input from trained wildlife or ecological specialists from the Utah Department of Natural Resources, the USFWS, and Rust E&I, species were identified and included for analysis. Input for the inclusion of these species was also considered from the discussions at several of the ETAG meetings. However, since all areas within the TEAD boundaries have not been inventoried, there is a possibility that species not identified could be relatively dominant in an existing community.

2.2.3.1 *Food Habits, Foraging Areas, and Home Ranges of Wildlife*

Information such as food habits, distribution at TEAD, abundance, and activity patterns of the key receptors are discussed in the biological profiles included in Appendix A.

The physical area (in acres) of home ranges, which selected TEAD key receptor species use for hunting and foraging, is presented in Table 7-1. Home range is the entire space or area that animals exploit on a regular basis and does not correspond directly to defended territory.

Area use factors (AUFs) are discussed in Section 7.2.2.2 and provided in Appendix B.

2.2.3.2 *Vegetation Species of Concern*

In addition to identification of wildlife species, a vegetation species-of-concern inventory was conducted at TEAD by Dr. Stanley Welsh from Brigham Young University on June 21, 1993. The presence of two Special Status plant species is possible at TEAD although the habitat quality is barely suitable. The species that could exist and their corresponding habitats are listed in Table 2-15. No Special Status plant species have been observed at TEAD.

2.2.4 ESA/RSA Selection

Field investigations for Phase II were performed within the ESAs and at the RSA. The criteria used in the selection of the SWMUs included in the three ESAs, as well as in the selection of the RSA, were as follows: (1) all major TEAD habitats were represented; (2) high COPC concentrations exist, representing the spectrum of COPCs that exist at the TEAD facility; and (3) sufficient numbers of species to be sampled were present at the selected SWMUs, and at

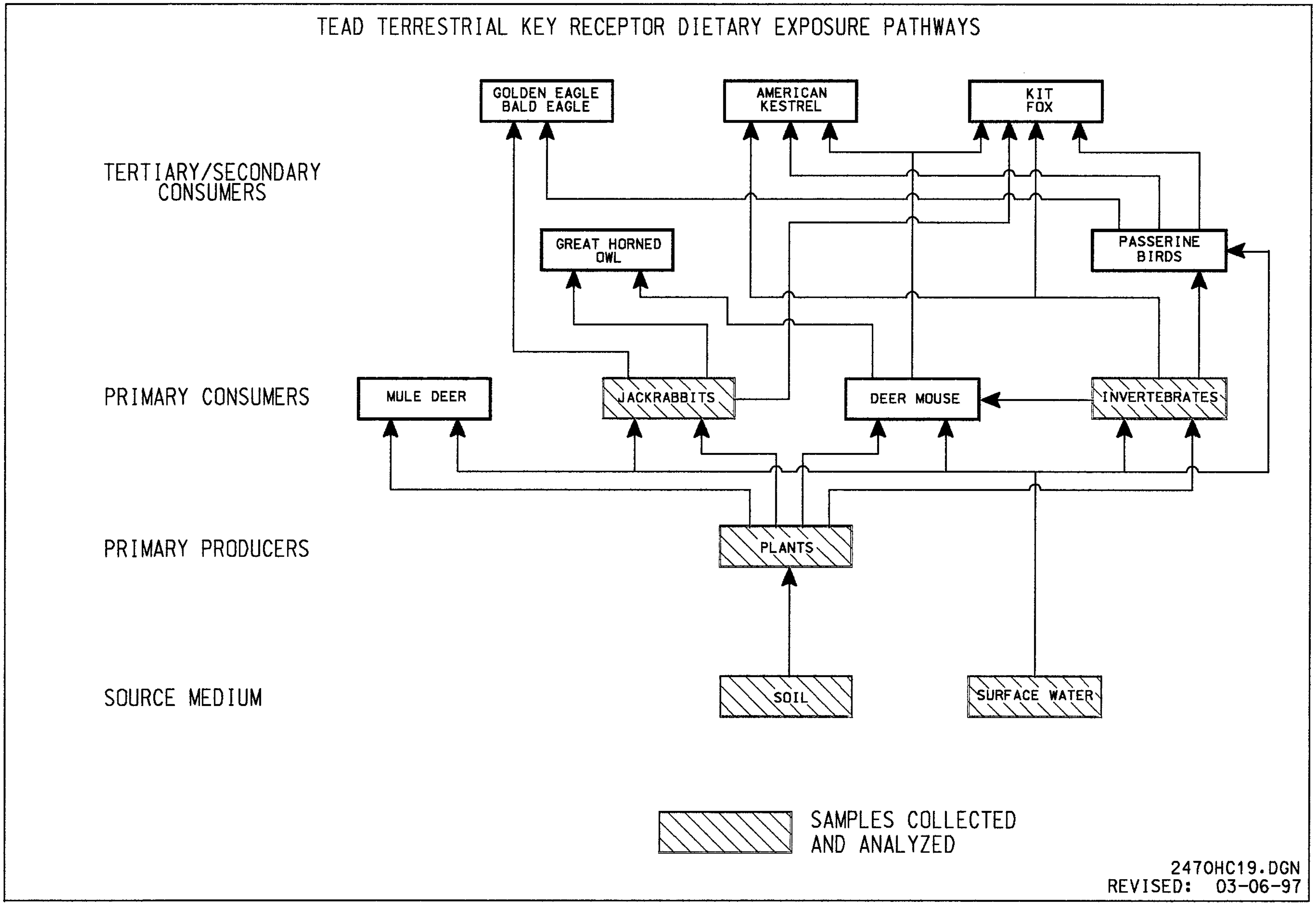

Figure 2-18. Key Terrestrial Receptor Exposure Pathways at TEAD

Table 2-14. Key Receptor Species for the SWERA

Taxa	Species	SWMU[a] Location (where observed)
Passerine (Perching) Birds	**Common Yellowthroat** (SS)[b]	14
	Western Bluebird	7, 14
Shorebirds/Waterfowl	Western Snowy Plover	n.o.[c]
	Long-billed Curlew (SS)	n.o.
	White-faced Ibis (SS)	n.o.
	Mountain Plover (SS)	14
	Mallard	14, 42, 45
	American Avocet	14
Raptors	**Golden Eagle** (SS)	all
	American Kestrel	all
	Great Horned Owl	21/37, 10/11
	Bald Eagle (SS)	14
	Swainson's Hawk (SS)	21/37, 10/11, 1b/1c
	Ferruginous Hawk (SS)	21/37, 10/11
	Northern Goshawk (SS)	n.o.
	Loggerhead Shrike	21/37, 10/11
	Burrowing Owl (SS)	n.o.
	Short-eared Owl (SS)	n.o.
Small Herbivores	**Deer Mouse**	all
	Great Basin Pocket Mouse	all
	Ord's Kangaroo Rat	all
	Western Harvest Mouse	all
	Mountain Vole	1b/1c
	Northern Pocket Gopher	1b/1c
Medium Herbivores	**Black-tailed Jackrabbit**	all
Large Herbivores	**Mule Deer**	21/37, 42, 45, 10/11
Insectivores	Spotted Bat (SS)	n.o.
Carnivores	**Kit Fox**	n.o.
Omnivores	Ringtail (SS)	n.o.
	Least Chipmunk	all
Plants	**Sweetclover/Rabbitbrush/Gumweed**	all
Invertebrates	**Grasshopper/Beetle**	all

Note.—Indicator species used in risk assessment modeling are in bold print.
[a]Solid waste management unit.
[b]Special status.
[c]Not observed, but habitat for the species does exist. Refer to Table 1-5.

Table 2-15. Vegetation Species of Concern and Corresponding Habitats

Species	Habitat	Potential TEAD Location
Clay phacelia (*Phacelia argillacea*)	Clay soils on slopes of Green River Shale Formation	Not likely
Ute Ladies-tresses (*Spiranthes diluvialis*)	Mountain meadows	Not likely

the RSA, so that removal of any species for sampling purposes would not adversely impact populations either by direct population reduction or indirectly through the removal of prey from upper level predators.

2.2.4.1 *ESA Selection*

Using the criteria listed above in Section 2.2.4, three ESAs were selected for evaluation. ESA-1 consists of the edge of the maintenance/administration area and the adjacent fields, and included SWMUs 42/45 for one sampling and study area. ESA-2 represents the remaining TEAD habitats and includes SWMUs 1b/1c, 10/11, 12/15, and 21/37. Adjacent SWMUs were grouped together because they (1) have similar vegetation (Table 2-16), (2) are in close proximity to one another, (3) have similar COPCs (Table 2-17), and (4) provided an area of study that included large herbivores and predators. ESA-3 included only the SWMU 14 Sewage Lagoons, which provided an aquatic/wetlands type habitat for an aquatic pathway study area. Figure 2-19 shows the locations of the three ESAs and their corresponding habitats.

Aerial photographs of the ESA SWMUs at 1:400 scale and corresponding topographic views are shown in Figures 2-20 through 2-31.

2.2.4.2 *RSA Selection*

Selection of an RSA was necessary to compare sampling results taken between the ESAs and background. The RSA was to be established upwind from the dominant southwesterly wind direction and was to be located in close proximity to TEAD. The selection of the RSA was determined by comparing the vegetation and wildlife species observed at the ESAs and the RSA communities, and then computing a similarity index, which is a quantitative measure of the attributes in common between these biotic communities. These community-based similarity coefficients were calculated using data based simply on the presence or absence of various species at the prospective study areas.

Table 2-16. SWMU Characteristics Used for ESA Selection

Plant Type	SWMU Number
Sagebrush/Juniper (with rabbitbrush, grasses, forbs, and rocky, gravelly soils)	23, 19, 20, **21**, **37**
Disturbed Grassland (with snakeweed, grasses, forbs, and gravelly soils and loams)	5, 13, 6, 7, 8, 40, 2, **12**, **15**, 43, 36
Sewage Lagoon (wetlands-type/pond)	**14**
Stormwater Discharge (wetlands-type)	**45**
Grassland/Juniper (with rabbitbrush, grasses, forbs, and sandy, loamy soils	22, 3, **10**, **11**
Greasewood (grasses, forbs, and clay loam soils)	35, 41, 1, 1a, **1b**, **1c**, 1d
Maintenance/Administration (rabbitbrush, kochia, sweetclover, gumweed, tumbleweed, introduced grasses, and disturbed soils)	33, 17, 31, 33, 9, 18, 24, 25, 30, 4, 26, 27, 28, 29, 34, 38, 39, **42**, 44, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55

Note.—Bold type indicates SWMUs selected for inclusion in ESAs.

Table 2-17. Summary of Ecological Study Areas

ESA/ RSA	SWMU	Description	Habitat Type	COPCs
ESA-1	42/45	Bomb Washout Building/Stormwater Discharge	Maintenance/ Disturbed Grassland	Metals, explosives, pesticides, SVOCs[a]
ESA-2	1b/1c	Open Burn/Open Detonation	Greasewood	Metals, explosives, VOCs[b], SVOCs, anions
	10/11	TNT Washout Facility/Laundry Effluent Ponds	Grassland, Juniper	Metals, explosives, SVOCs, TPHC[c], VOCs
	12/15	Pesticide Disposal/ Sanitary Landfill	Disturbed Grassland	Metals, pesticides, PCBs[d], SVOCs, VOCs
	21/37	Deactivation Furnace/ Contaminated Waste Processor	Sagebrush, Juniper	Metals, cyanide, dioxins, furans, explosives, PAHs[e], VOCs
ESA-3	14	Sewage Lagoon	Aquatic	Metals, cyanide, organics
RSA	Offsite	Reference Study Area	Juniper, Sagebrush, Grassland	Inorganics, SVOCs, pesticides, dioxins *

[a]Semi-volatile organic compounds.
[b]Volatile organic compounds.
[c]Total petroleum hydrocarbons.
[d]Polychlorinated biphenyls.
[e]Polynuclear aromatic hydrocarbons.
* Note.- Determined after selection and after chemical analysis.

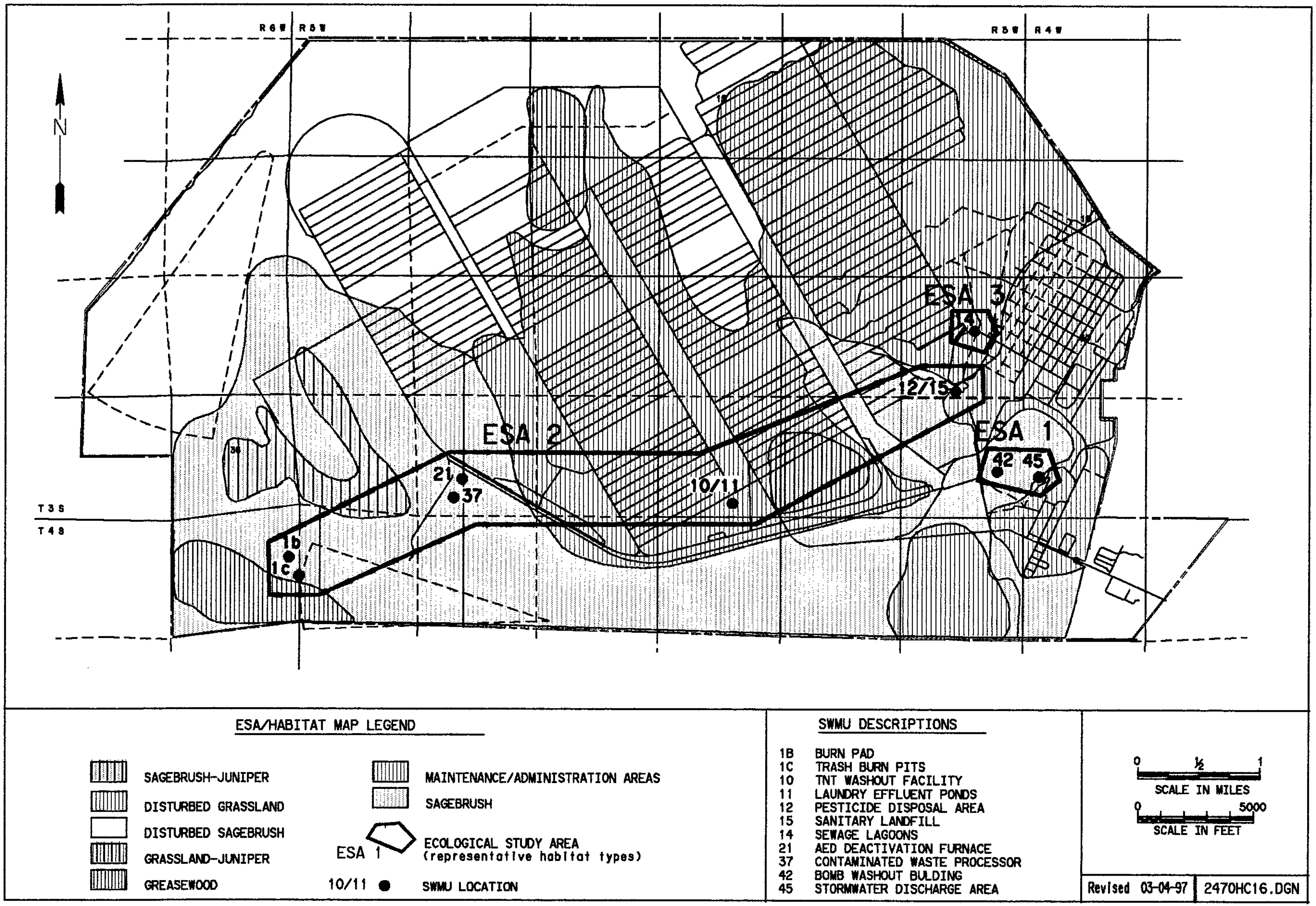

Figure 2-19. Location of Ecological Study Areas

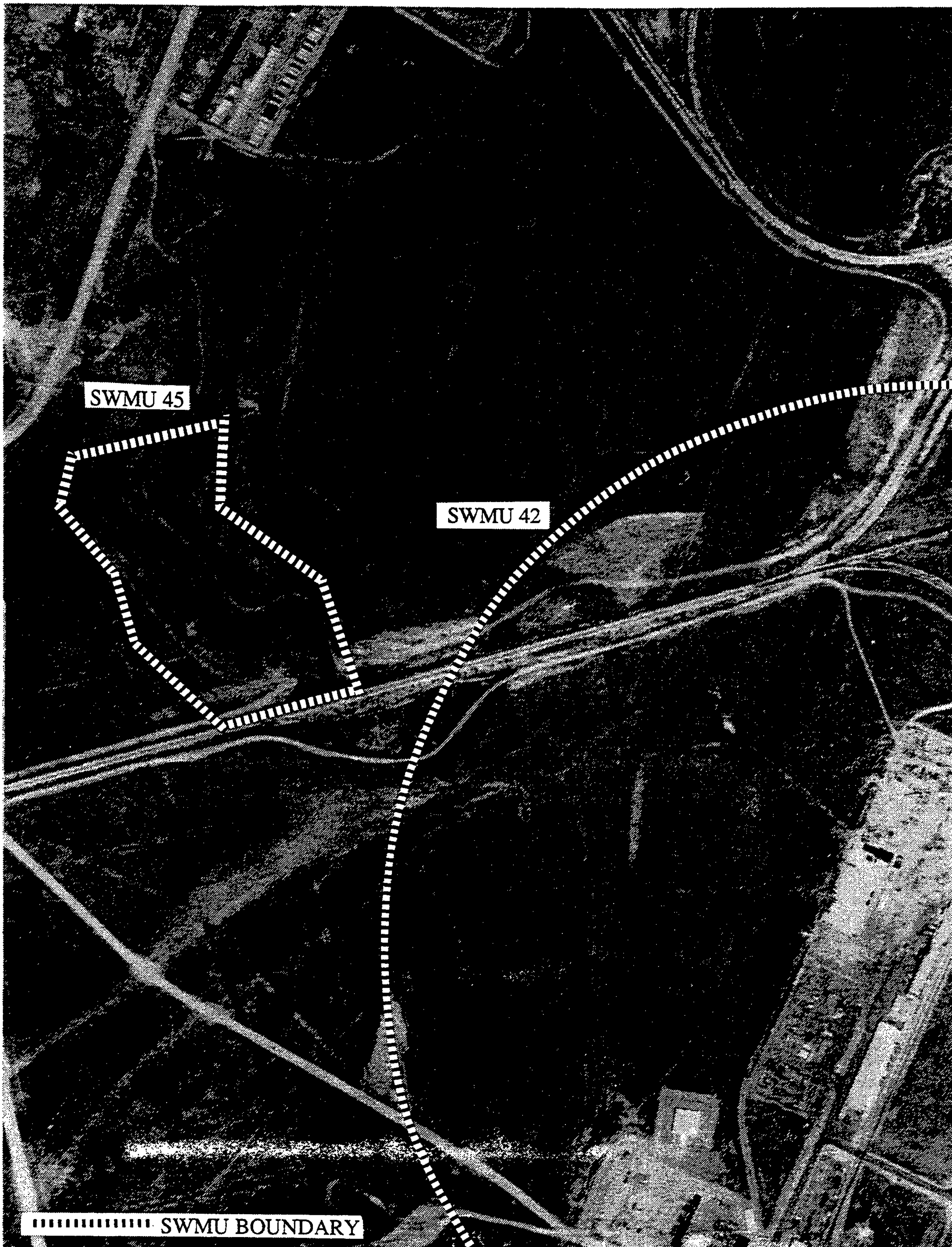

Figure 2-20. Aerial Photo of SWMU 42 (Bomb Washout Building) and SWMU 45 (Stormwater Discharge)

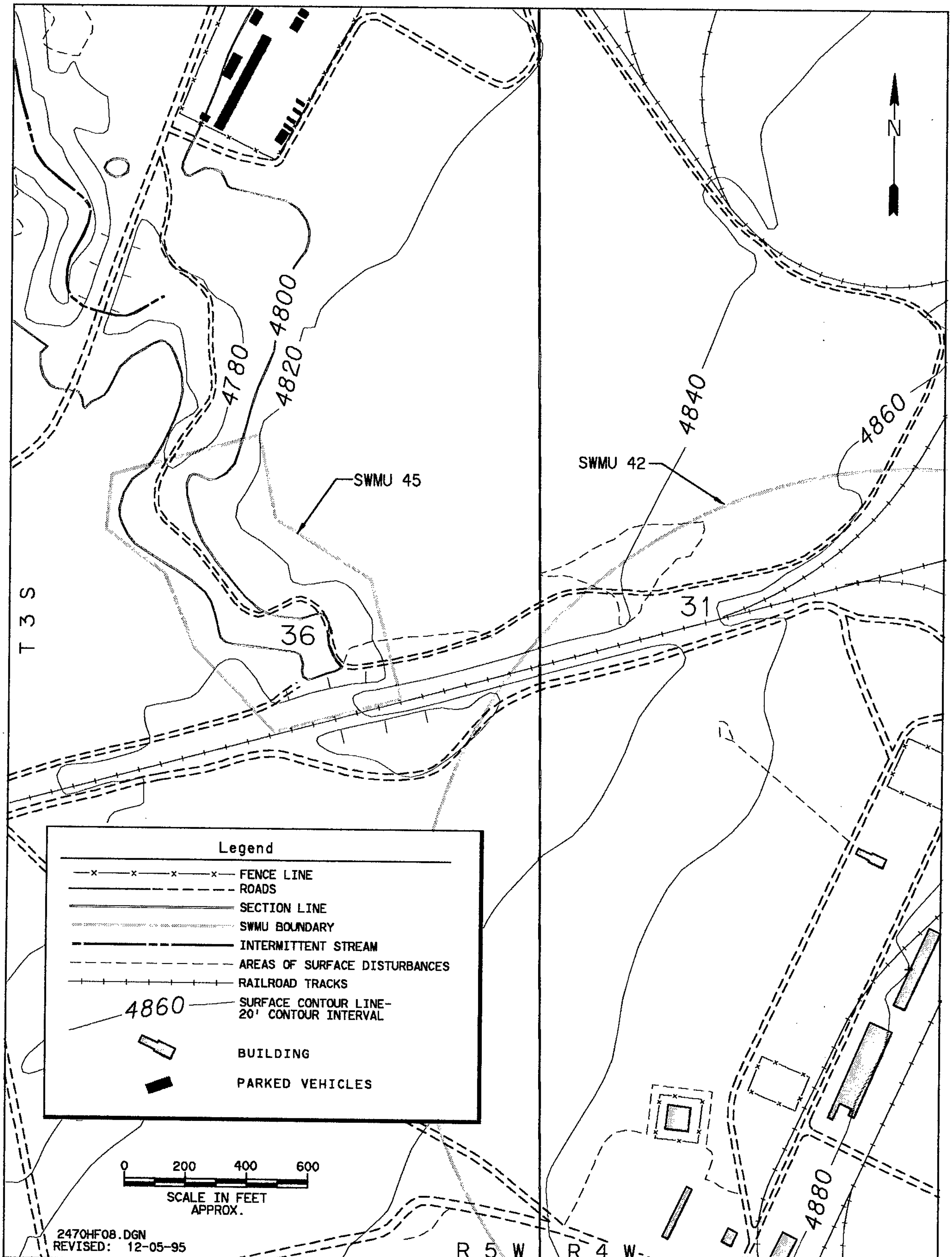

Figure 2-21. Topographic View of SWMU 42 (Bomb Washout Building) and SWMU 45 (Stormwater Discharge)

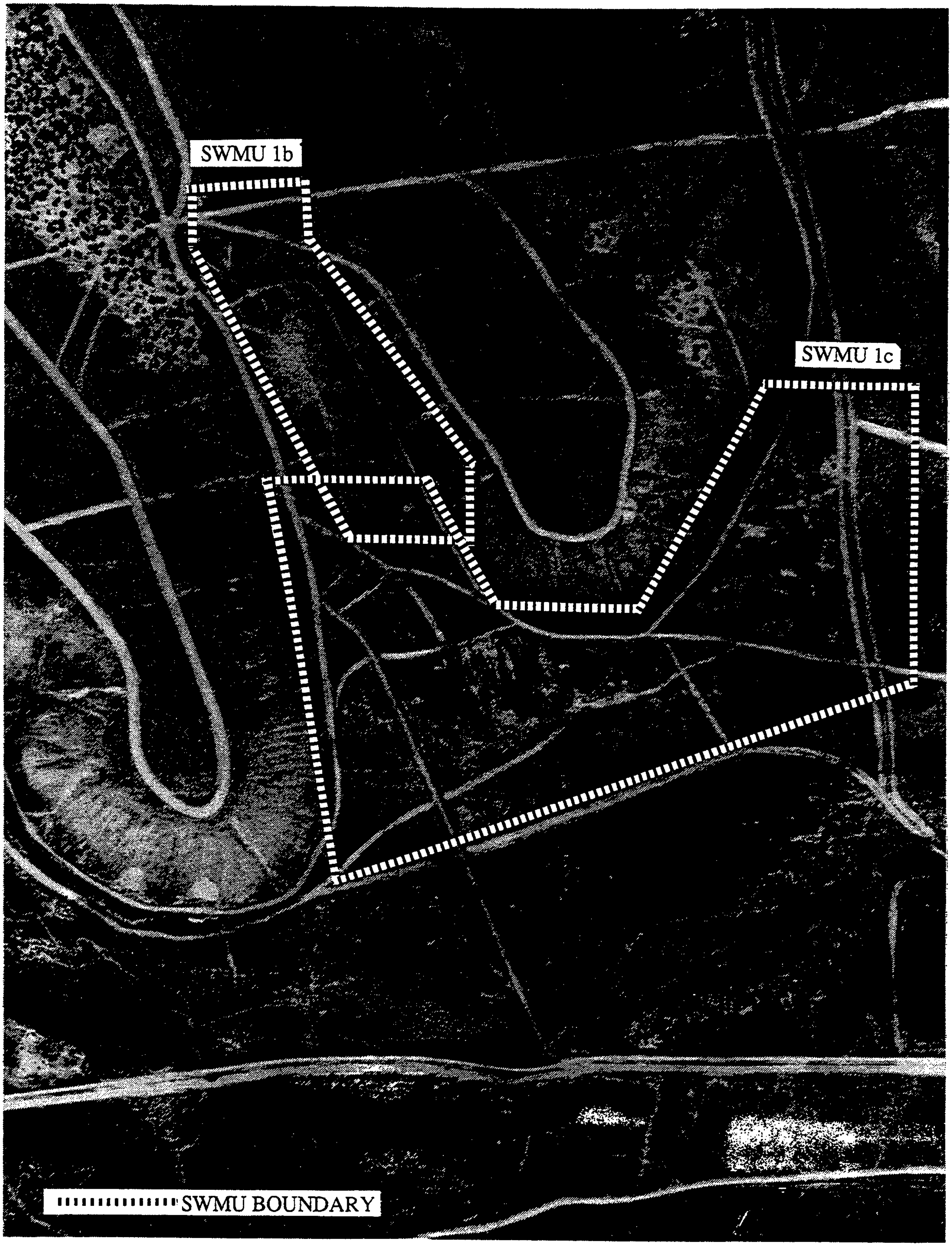

Figure 2-22. Aerial Photo of SWMU 1b (Burn Pads) and SWMU 1c (Trash Burn Pits)

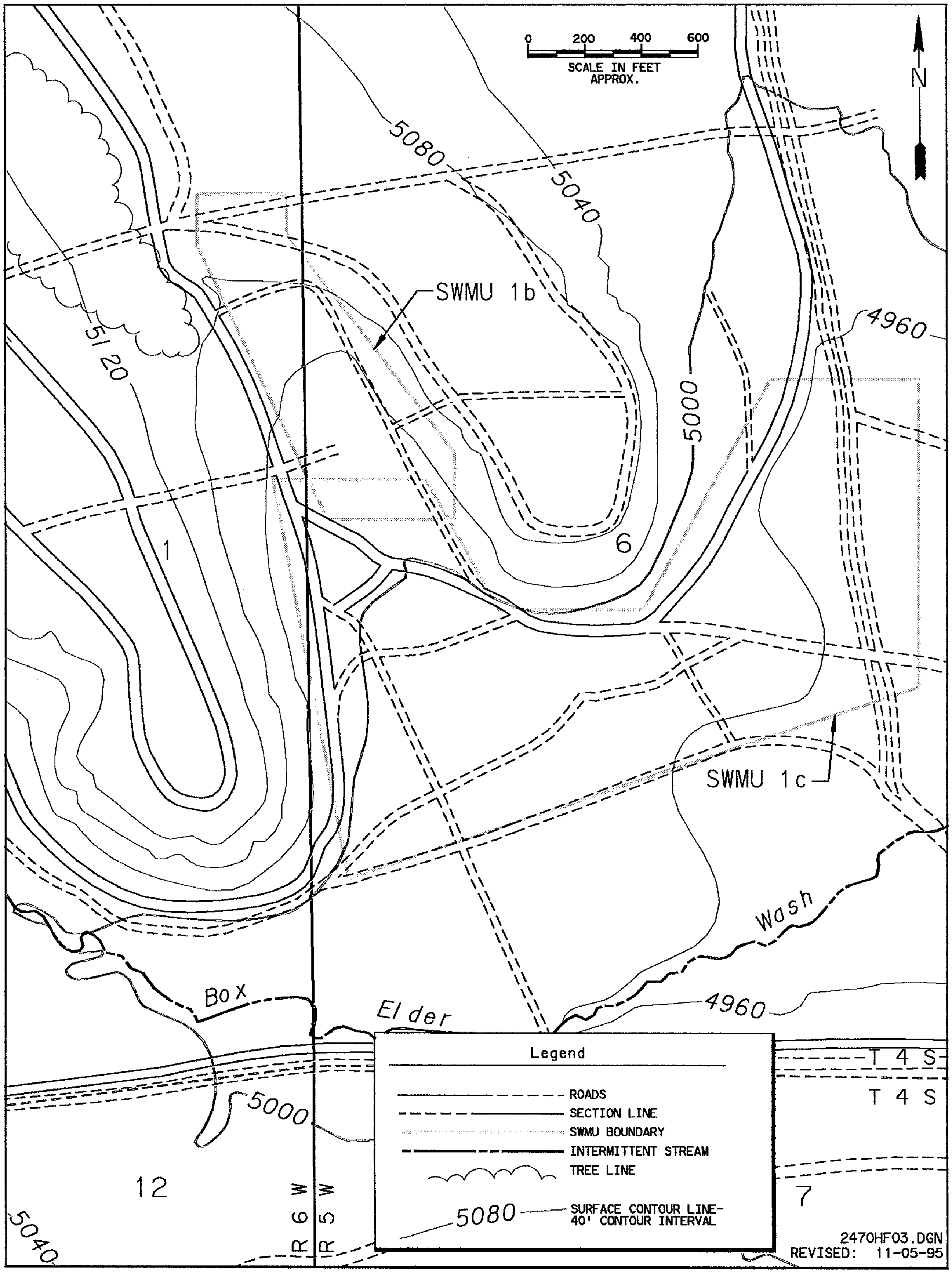

Figure 2-23. Topographic View of SWMU 1b (Burn Pads) and SWMU 1c (Trash Burn Pits)

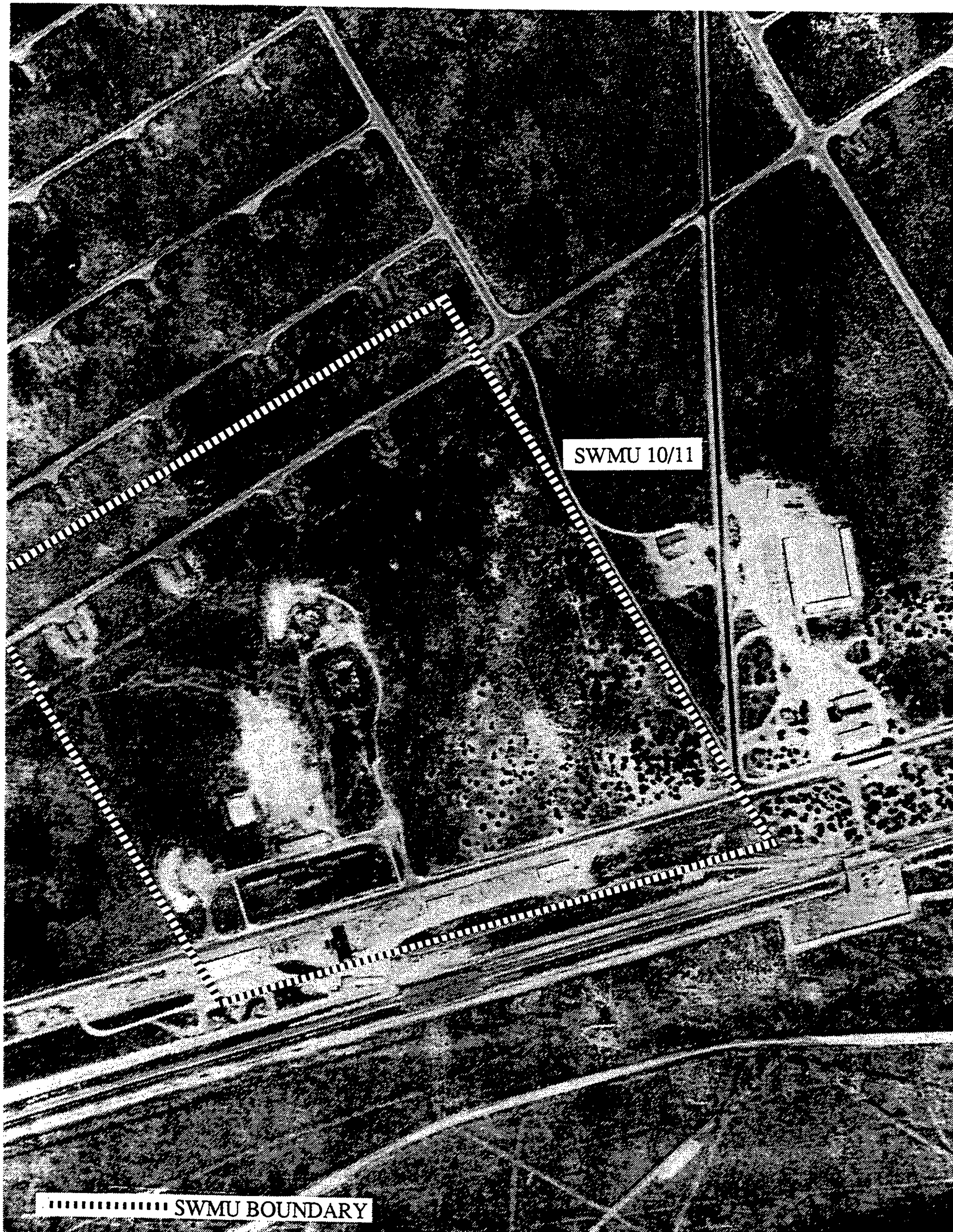

Figure 2-24. Aerial Photo of SWMU 10 (TNT Washout Facility) and SWMU 11 (Laundry Effluent Ponds)

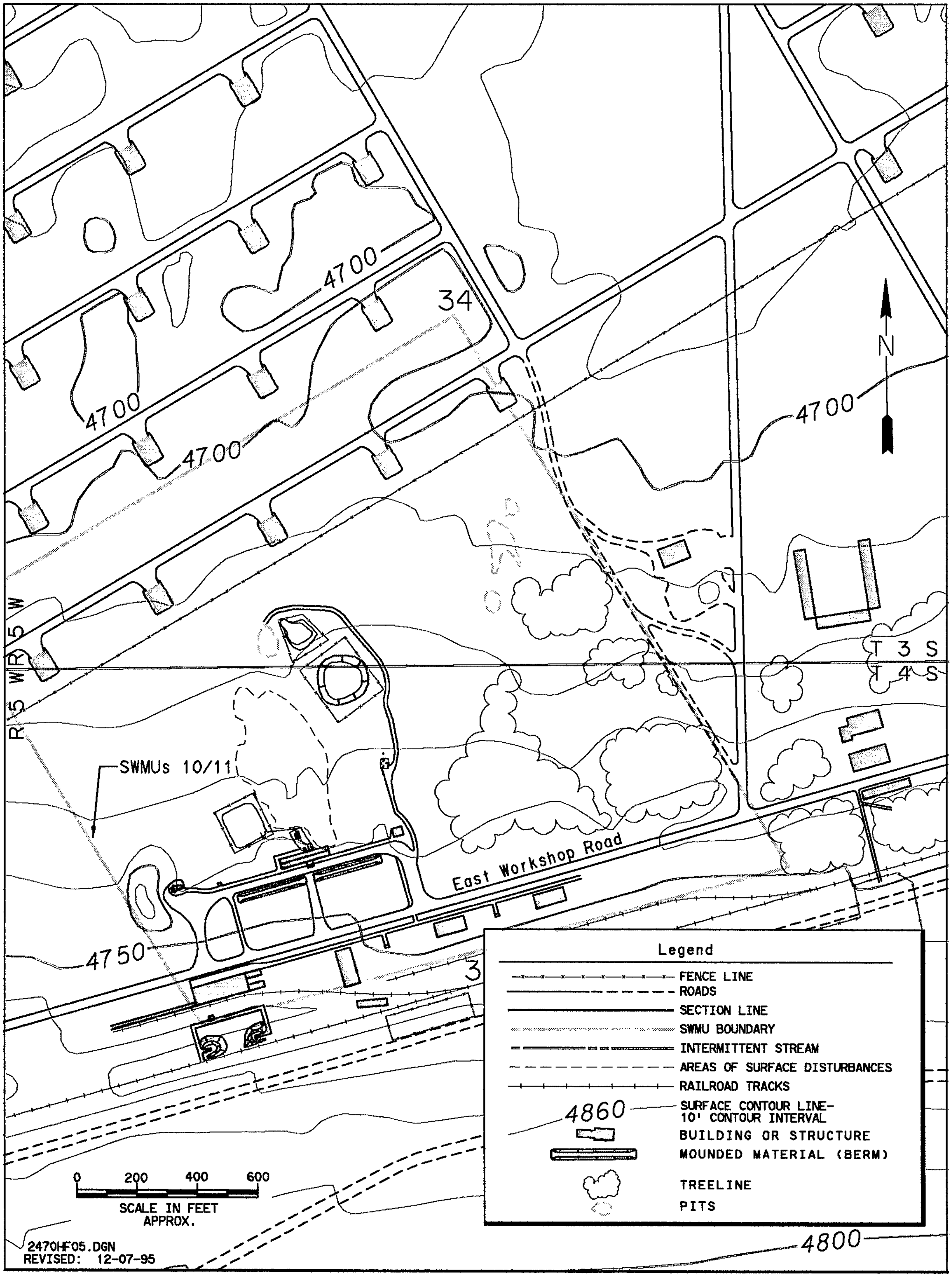

Figure 2-25. Topographic View of SWMU 10 (TNT Washout Facility) and SWMU 11 (Laundry Effluent Ponds)

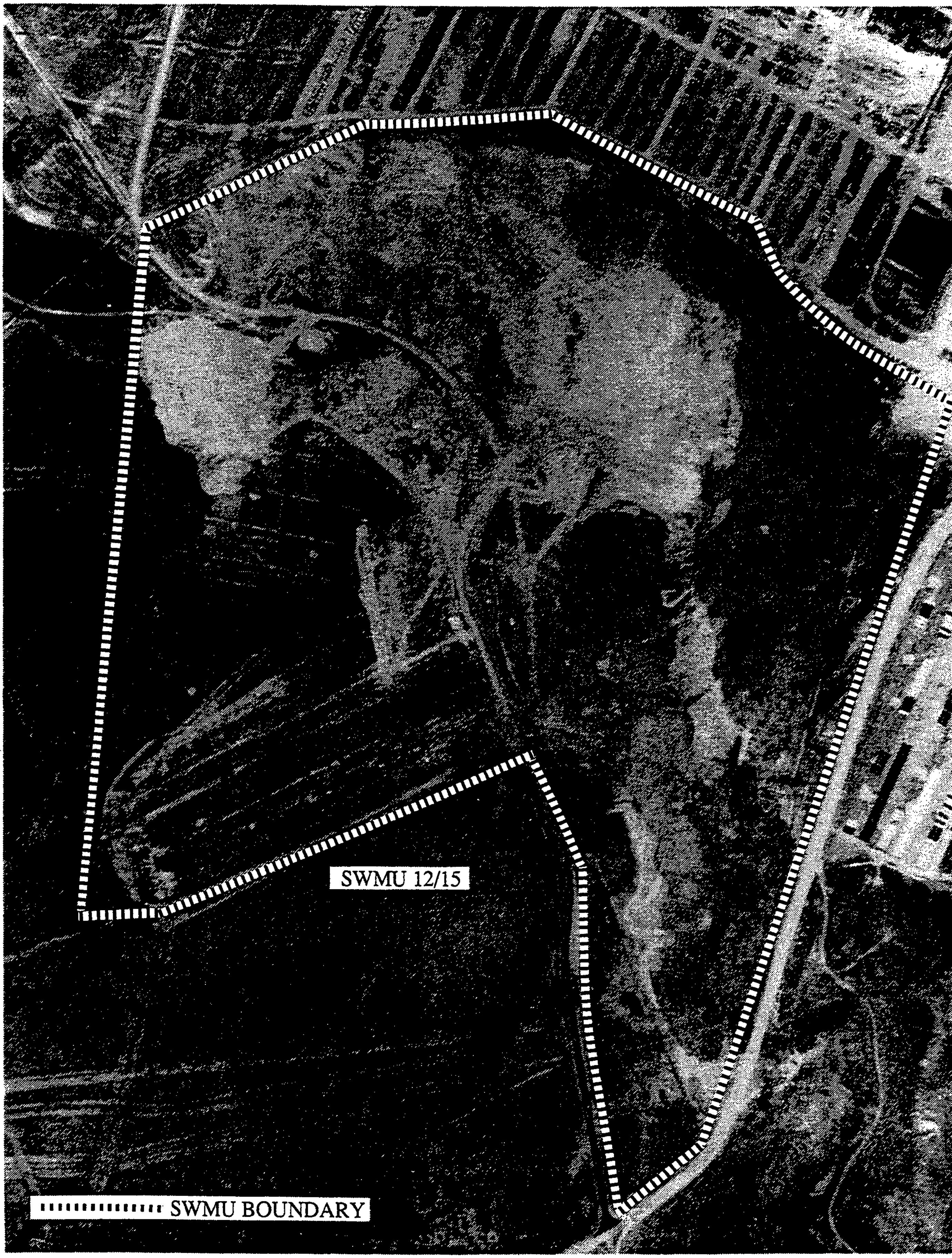

Figure 2-26. Aerial Photo of SWMUs 12/15 (Pesticide Disposal/Sanitary Landfill)

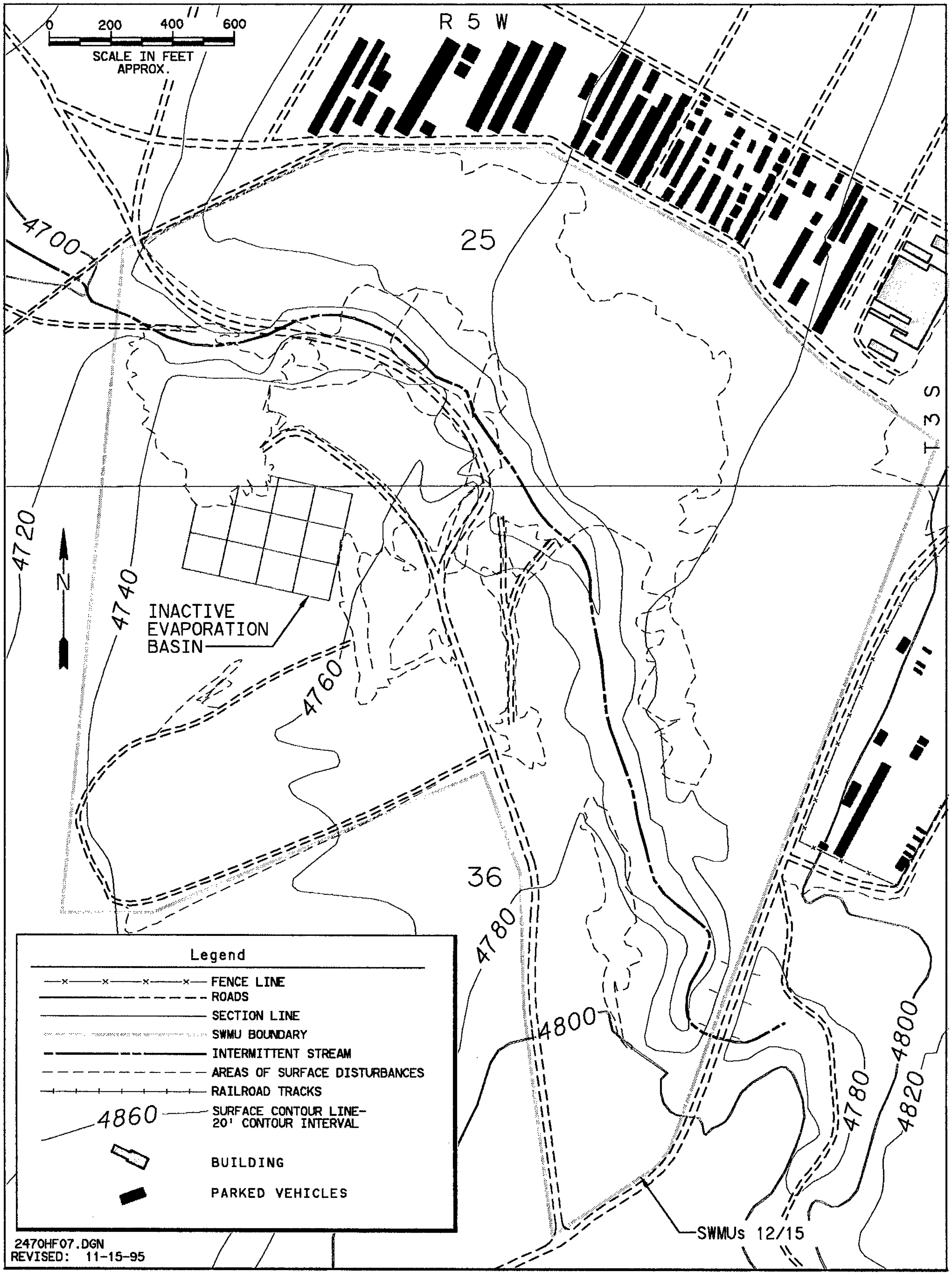

Figure 2-27. Topographic View of SWMUs 12/15 (Pesticide Disposal/Sanitary Landfill)

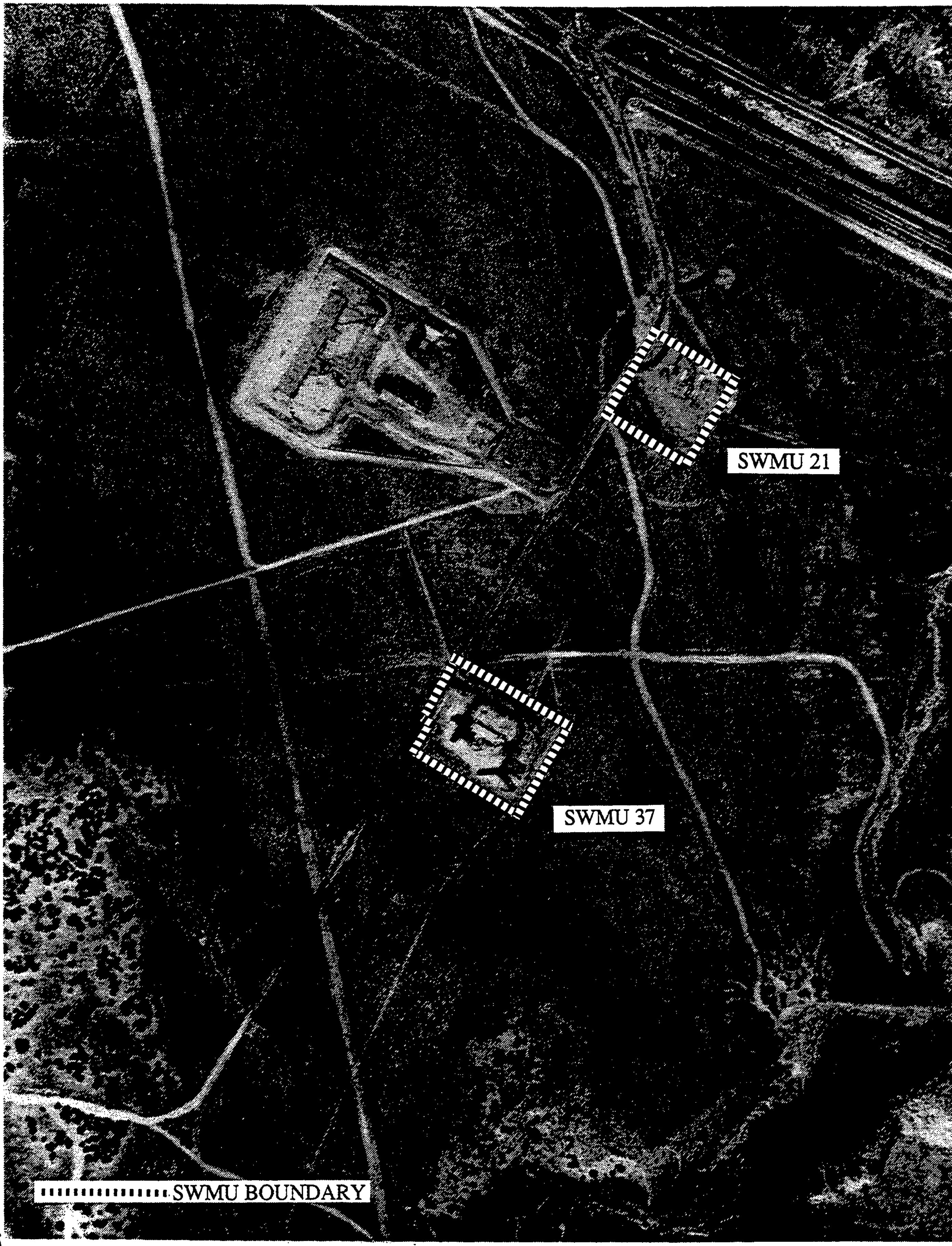

Figure 2-28. Aerial Photo of SWMU 21 (AED Deactivation Furnace) and SWMU 37 (Contaminated Waste Processor)

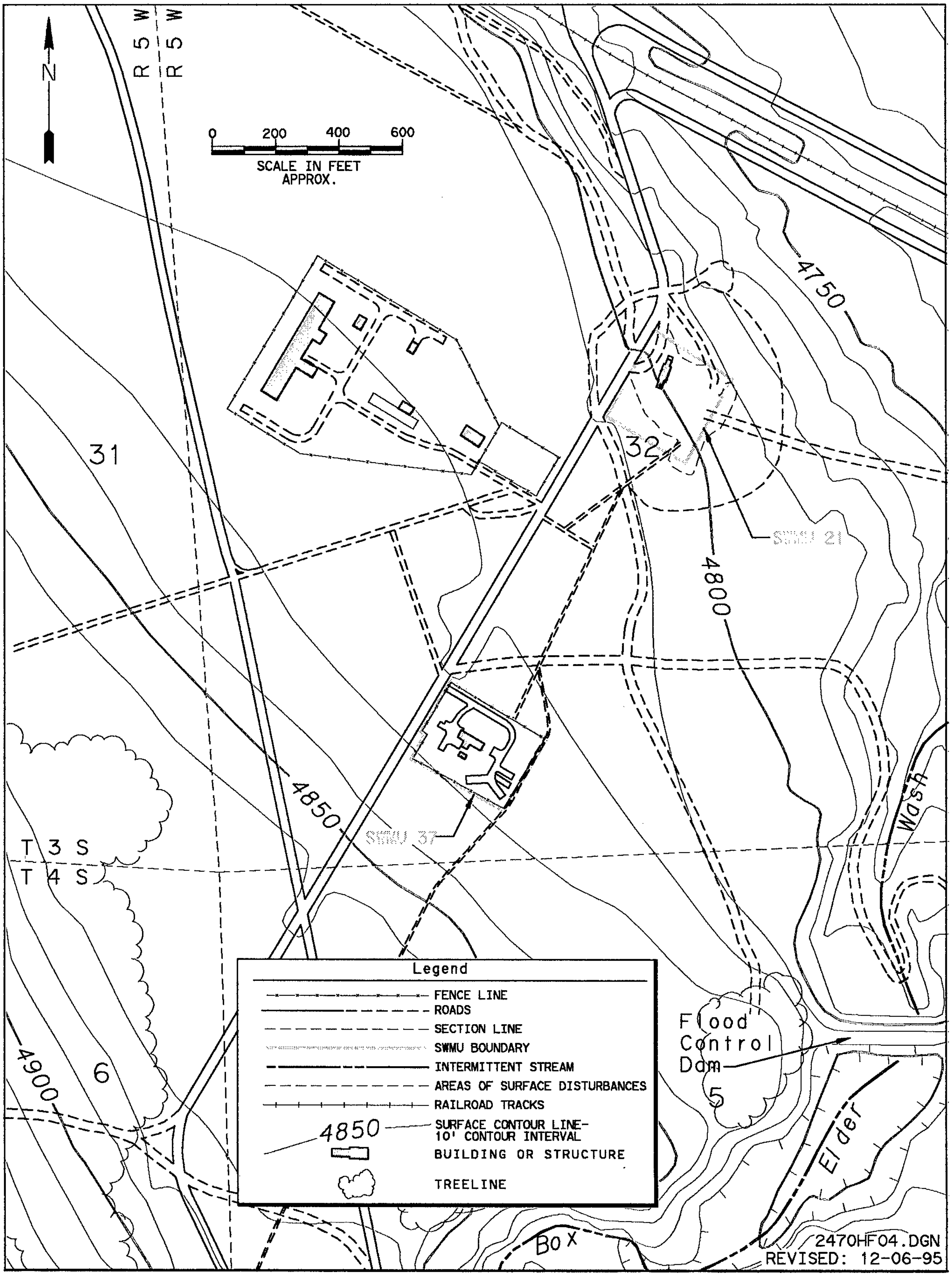

Figure 2-29. Topographic View of SWMU 21 (AED Deactivation Furnace) and SWMU 37 (Contaminated Waste Processor)

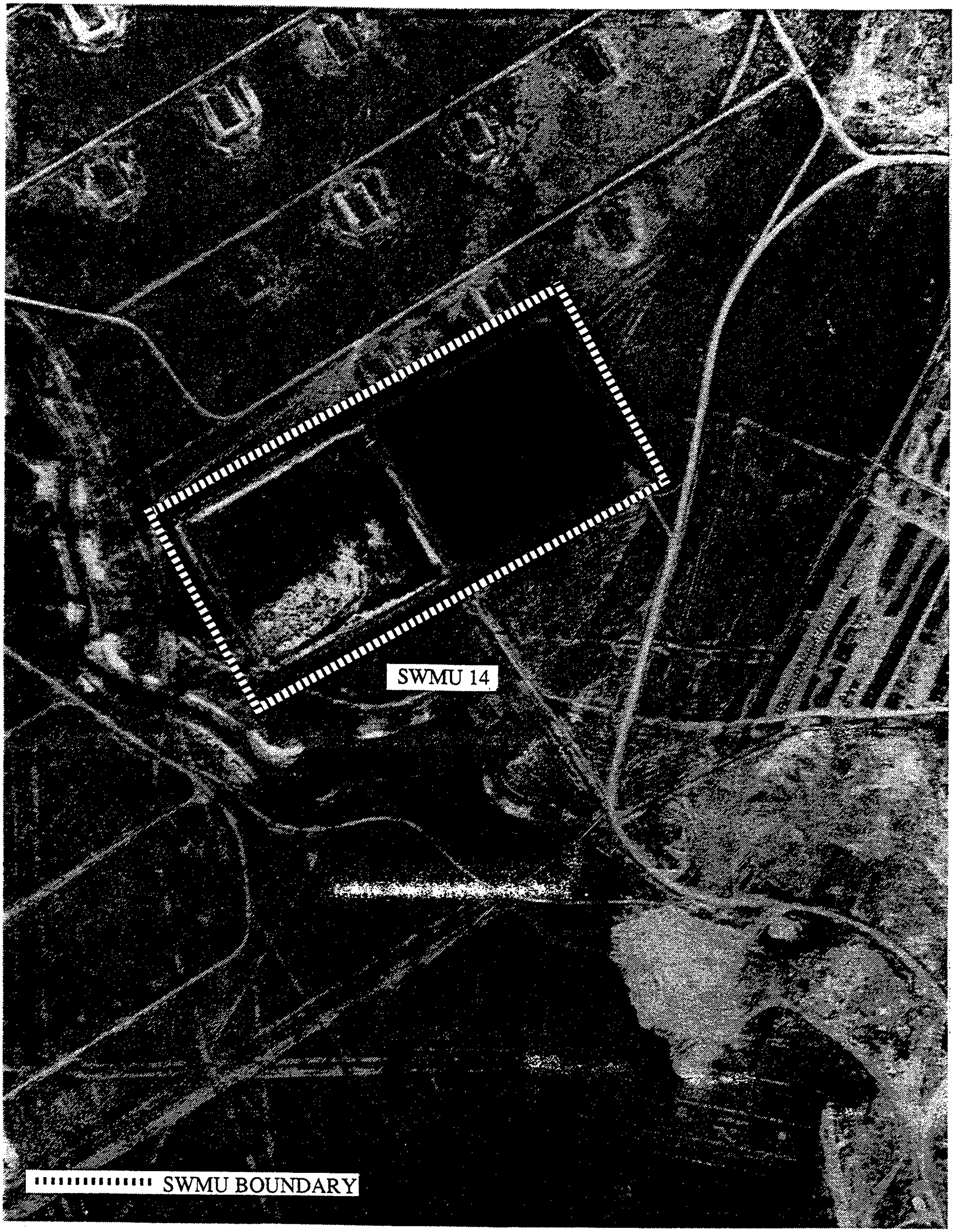

Figure 2-30. Aerial Photo of SWMU 14 (Sewage Lagoons)

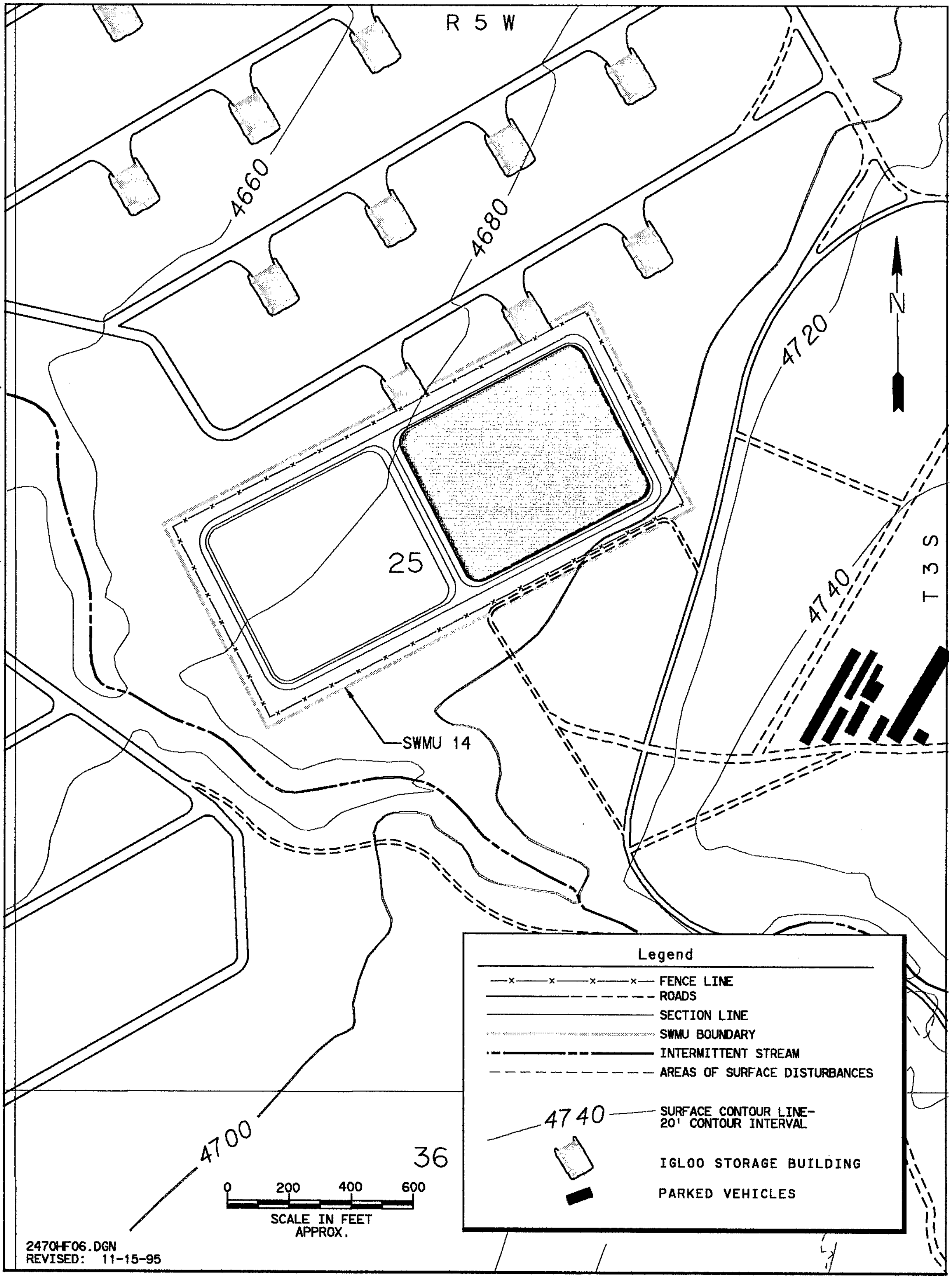

Figure 2-31. Topographic View of SWMU 14 (Sewage Lagoons)

The most widely used coefficient for comparing communities is the coefficient of community (sometimes referred to as Simpson's similarity index), the value of which varies from 0.0 for communities having no species in common to 1.0 for identical communities. The equation for deriving these values is:

$$SI = \frac{2w}{a+b} \qquad \text{(Equation 2-2)}$$

where

SI = similarity index
w = sum of shared species (at TEAD & RSA)
a = sum of TEAD species
b = sum of RSA species

A similarity index value of 0.75, or successful matches or comparisons occurring 75 percent of the time, was the basis for acceptance of the potential RSA. Other ecological criteria used for comparing the similarity between the selected SWMUs and the RSA include, but are not limited to:

- General vegetation/wildlife species and habitat characteristics in common between ESAs and the RSA
- Topographic and elevational similarities (slope, aspect)
- Climatic patterns (amount of precipitation, wind direction)
- Soil types

The results of the similarity index comparison between TEAD and the two potential RSAs are shown in Tables 2-18 and 2-19. RSA Location #1, the South Mountain Area, similarity index was calculated at 0.93. The similarity index for the second RSA location considered, near Stockton, was 0.67. The South Mountain Area RSA was selected because of its higher similarity index and comparability with other TEAD ecological features. The South Mountain RSA is representative of both ESA-1 and ESA-2, and was located on government lands approximately 4 miles south of the TEAD facility and north of a prominent geological barrier (South Mountain). Location of the South Mountain site in the same basin as TEAD was a significant factor in the choice of this RSA. Furthermore, the predominant RSA soil types—Hiko Peak and Taylorsflat—are the same as much of the TEAD soils as shown on Figure 1-5. Cooperation in the field studies and sampling was obtained from the Bureau of Land Management (BLM). Figure 2-32 shows the location of the RSA that was selected. Additional topographical detail of the RSA is shown in Figures 5-8 and 5-9.

No RSA was required for ESA-3 because the variable nature of sewage lagoons is such that no valid background comparisons for the chemical analyses would be possible.

Table 2-18. Similarity Index Comparison for RSA Location #1 -South Mountain Area

Species	TEAD	Reference Study Area
Artemisia tridentata (Big sagebrush)	Yes[a]	Yes
Sarcobatus vermiculatus (Black greasewood)	Yes	Yes
Gutierrezia sarothrae (Broom snakeweed, Matchweed)	Yes	Yes
Poa secunda (Sandberg's bluegrass)	Yes	Yes
Agropyron smithii (Western wheatgrass)	Yes	Yes
Agropyron spicatum (Bluebunch wheatgrass)	Yes	Yes
Opuntia species (Central pricklypear cactus)	Yes	Yes
Bromus tectorum (Cheatgrass)	Yes	Yes
Sporobolus cryptandrus (Sand dropseed)	Yes	Yes
Elymus canadensis (Russian wildrye)	Yes	Yes
Aristida purpurea (Purple three-awn)	Yes	No[b]
Stipa comata (Needle and threadgrass)	Yes	No
Chrysothamnus nauseosus (Rubber rabbitbrush)	Yes	Yes
Chrysothamnus viscidiflorus (Green rabbitbrush)	Yes	Yes
Stipa hymenoides (Indian ricegrass)	Yes	Yes
Stipa trachycaulum (Slender wheatgrass)	Yes	Yes
Total observed at location	16	14
Elevation of locations	4,900 ft.	5,200 ft.
Soils characteristics	Sandy/gravelly loam	Silty/Sandy Loam
Aspect[c]	NE	E
Climate and slope are essentially the same		

Note.—Similarity Index (SI) = 0.93

Where $SI = \frac{2w}{a+b}$, w= total shared species = 14
a= species observed at TEAD = 16
b= species observed at RSA = 14

[a]Yes= Observed at location.
[b]No= Not observed at location.
[c]Aspect=general direction of exposure of site.

Table 2-19. Similarity Index Comparison for RSA Location #2 - Near Stockton

Species	TEAD	Reference Study Area
Artemisia tridentata (Big sagebrush)	Yes[a]	Yes
Sarcobatus vermiculatus (Black greasewood)	Yes	Yes
Gutierrezia sarothrae (Broom snakeweed, Matchweed)	Yes	No[b]
Chrysothamnus nauseosus (Rubber rabbitbrush)	Yes	Yes
Chrysothamnus viscidiflorus (Green rabbitbrush)	Yes	Yes
Poa secunda (Sandberg's bluegrass)	Yes	Yes
Agropyron smithii (Western wheatgrass)	Yes	No
Agropyron spicatum (Bluebunch wheatgrass)	Yes	Yes
Opuntia species (Central pricklypear cactus)	Yes	No
Bromus tectorum (Cheatgrass)	Yes	Yes
Sporobulus cryptandrus (Sand dropseed)	Yes	No
Elymus canadensis (Russian wildrye)	Yes	No
Aristida purpurea (Purple three-awn)	Yes	No
Stipa comata (Needle and threadgrass)	Yes	No
Stipa hymenoides (Indian ricegrass)	Yes	No
Stipa trachycaulum (Slender wheatgrass)	Yes	Yes
Total observed at location	16	8
Elevation of locations	4,900 ft.	5,000 ft.
Aspect[c]	NE	W
Soils characteristics, climate, and slope are essentially the same		

Note.—Similarity Index (SI) = 0.67

Where $SI = \frac{2w}{a+b}$, w= total shared species = 8

a= species observed at TEAD = 16

b= species observed at RSA = 8

[a]Yes= Observed at location.

[b]No= Not observed at location.

[c]Aspect=general direction of exposure of site.

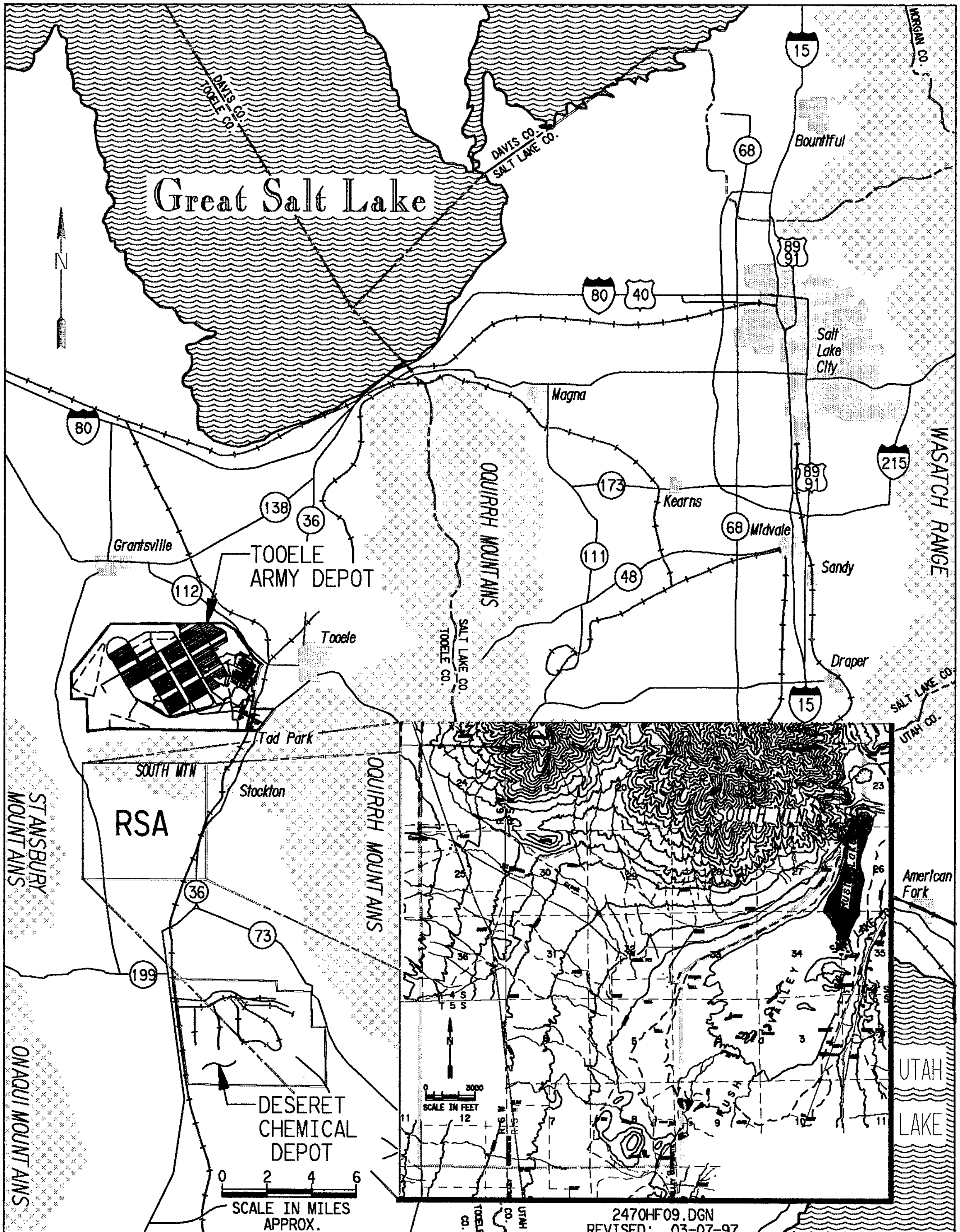

Figure 2-32. Location of the RSA in Relation to TEAD

3.0 FIELD WILDLIFE AND VEGETATION SURVEYS AND ANALYTICAL SAMPLE COLLECTION

Ecological investigations, as presented below, were conducted by Rust E&I during the summer and fall of 1994 at the TEAD facility. These investigations included qualitative vegetation, mammal, bird, and threatened and endangered species surveys for those SWMUs previously identified by the USAEC for inclusion in the SWERA as potential ESAs, and for those SWMUs where ecological habitat was present. These surveys also included the recording of incidental observations, such as signs of amphibians and reptiles. Quantitative vegetation and wildlife surveys, including trap and release studies, were also conducted for the SWMUs that were located within the ESAs and the RSA. Additionally, co-located soil, vegetation, and jackrabbit samples were collected at ESA-1, ESA-2, and the RSA. Collection of grasshoppers and beetles at ESA-2 and the RSA was also scheduled for the fall of 1994 but was delayed until late summer 1995. Completed field data forms for the field surveys are included in Appendix C.

3.1 QUALITATIVE FIELD WILDLIFE AND VEGETATION SURVEYS FOR TEAD SWMUs AND THE RSA

Qualitative surveys were conducted at each SWMU and the RSA in order to characterize the current TEAD ecosystem. The emphasis of these surveys was to describe the nature of the vegetative and wildlife communities on a site-wide basis for the identification of exposure pathways and receptors as discussed in Section 2.2.3 of this report. The surveys generated a field inventory describing the existing ecological conditions in terms of habitats, vegetation, and wildlife for each SWMU and the RSA (see Section 6.1). The qualitative surveys also provided the information used to select the ESAs, the RSA, and the assessment endpoints.

3.2 QUANTITATIVE FIELD WILDLIFE AND VEGETATION SURVEYS FOR TEAD SWMUs AND THE RSA

Quantitative surveys within ESA-1, ESA-2, and the RSA were conducted in order to collect biotic data on the ecosystem structural components such as species composition, abundance, and relative dominance. This information provides descriptions of population and community dynamics so that the overall health of the ecosystem can be evaluated. Data on density, cover, frequency, and species present were collected during these quantitative surveys; this included plant species counts and observations, as well as trapping of small mammals and visual observations of other wildlife.

3.2.1 Determination of Sample Size

The procedure used for the quantitative vegetation surveys was designed so that a statistically valid quantity of data could be collected from the plant populations and communities present at

each SWMU. The sufficient number of samples for biota, and co-located soils was determined to be 15 for each category. This quantity was approved by the ETAG at a meeting held on July 6, 1994, at TEAD.

3.2.2 Selection of Vegetation Surveys and Small Mammal Trapping Locations

3.2.2.1 *Vegetation*. Surveys for vegetation at each SWMU in ESA-1 and ESA-2 were conducted using a grid-based random-number sampling approach. SWMUs were gridded on a location map prior to field studies and sampling efforts. Seven north-south grid lines and seven east-west grid lines spaced 100 meters apart were centered over pairs of SWMUs, selections of which are described in Section 2.2.4. This created a total of 36 blocks, which were numbered from left to right, beginning with the northeast (NE) corner (#1) and ending with the southeast (SE) corner (#36). Five of these blocks were then randomly selected using a computer-generated random number with the software program MINITAB®. After the five 100-meter-by-100-meter blocks were selected, a corner on each block (NE, SE, SW, NW) was chosen using a random number table. This selected corner point became the starting point of the transect line and continued in a straight line for 33 meters as shown in Figure 3-1. The transect line was oriented in a clockwise direction from the selected corner. The selection of the five gridded blocks and the transect location corners for the RSA was done in the field using a random numbers table instead of the MINITAB® program.

Vegetation was sampled using the point intercept method along the selected transect locations. A 3-foot-wide belt along the transects was used to estimate density of shrub and half-shrub species. Herbaceous cover and frequency were obtained by dropping a point at every 0.3 meter perpendicular to the ground surface and the transect line, and the plant intercepted by the point was recorded. If a plant was not encountered, the transect was recorded as a rock, soil, or litter. Information was recorded on Field Data Form 1.5, *Point Intercept Vegetation Cover Data Form,* which is included in Appendix C.

3.2.2.2 *Small Mammals*. The small mammal trapping location was randomly selected (again using the MINITAB® program) from one of the five vegetation transect location grids described above. The grid was 60 meters by 60 meters (approximately 40,000 square feet), consisting of five trap lines oriented in north-south and east-west directions and placed at 15-meter intervals as shown in Figure 3-2. The east/west lines were designated as 1 through 5 and the north/south lines designated as A through E. Trapping locations were surveyed from a control point using a 100-meter tape and Brunton compass. At each intersection, one Smith live trap was placed and baited with rolled oats or barley in the late afternoon or early evening and checked each morning. Cotton balls were added to the traps to provide nesting material for the captured animals. This "trap setting, baiting, and checking" procedure was repeated for 3 consecutive nights. Each captured animal was identified as to species and sex and weighed to the nearest gram. Mature animals were also designated as reproductive or non-reproductive. A life history designation was used to identify adults, sub-adults, and juveniles. Each animal captured received a unique number through the clipping of different combinations of toes in order to identify and track recaptured individuals and to estimate species population

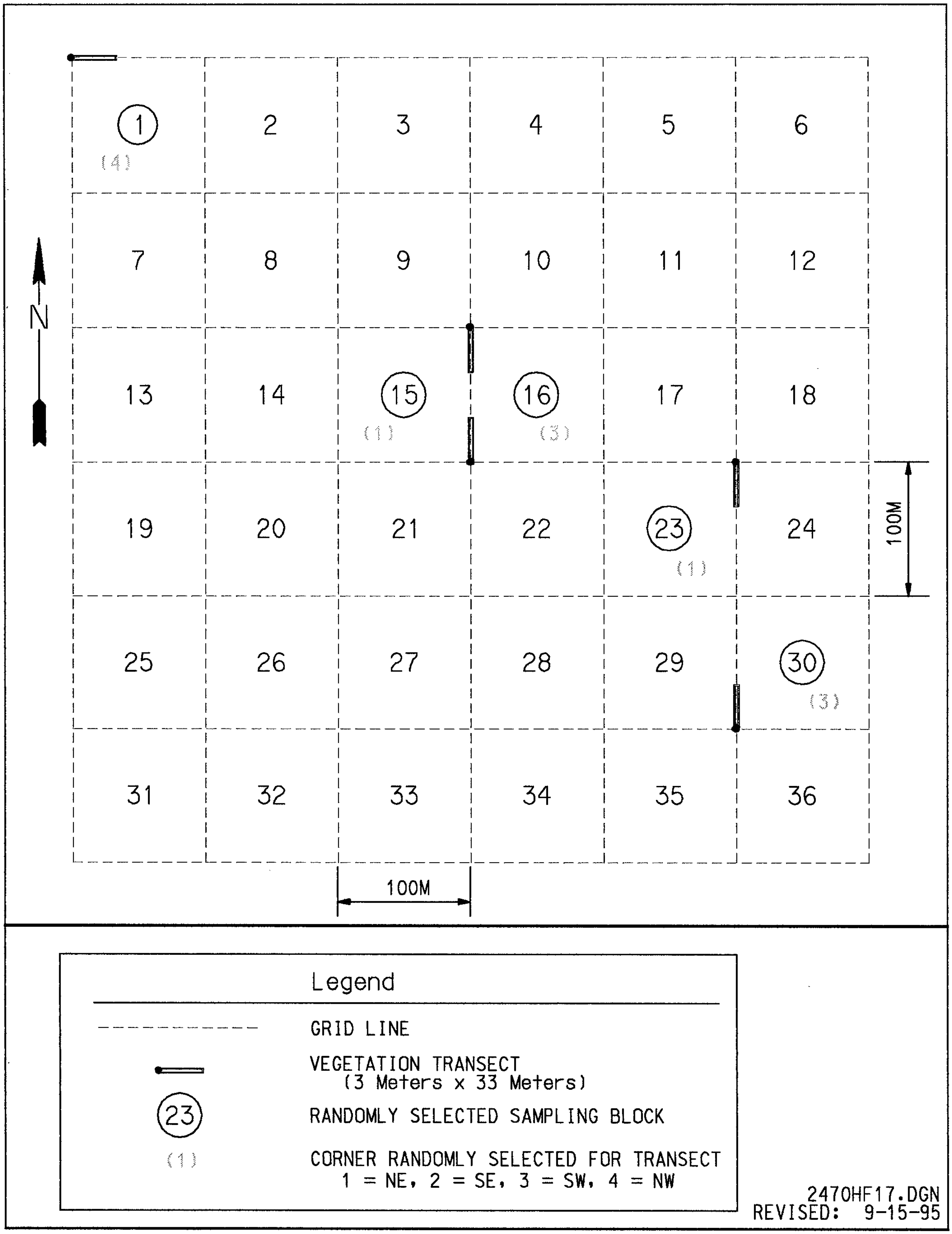

Figure 3-1. Vegetation Grid Selection

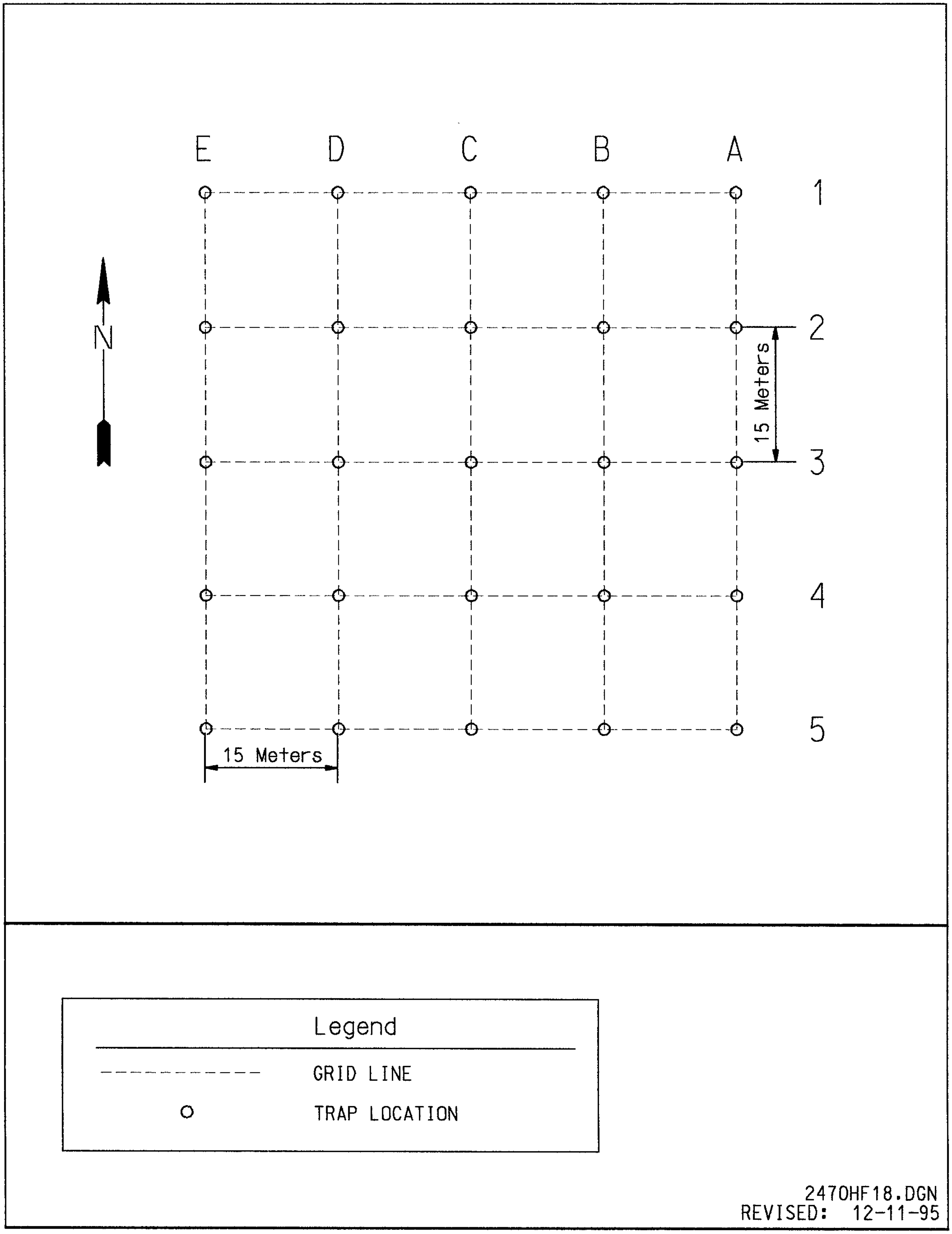

Figure 3-2. Mammal Grid Selection

densities and home range (no more than two toes were removed from each individual that was trapped, and any recaptured animals were not "toe clipped" a second time).

The actual handling and release of the small mammals, as well as the decontamination/ disinfection of the traps, were conducted in Level C personal protective equipment (PPE), following health and safety precautions set forth in Section 1.4.3.1 of the SWEAP/QAPjP. These precautions were taken to minimize possible exposure to deer mice infected with Hantavirus, which can be fatal to humans.

All data from the surveys were recorded on Field Data Form 1.4, *Small Mammal Live Trapping*, which are included in Appendix C. Terms utilized to describe and qualify biota specimens are defined in Appendix A under *Definition of Terms Used in the Quantitative Wildlife and Vegetation Surveys.*

3.3 CO-LOCATED SOIL AND BIOTA TISSUE SAMPLING

Vegetation samples were collected from ESA-1, ESA-2, and the RSA, and jackrabbit samples were collected from ESA-1 and the RSA during the summer of 1994. Terrestrial invertebrates (grasshoppers and beetles) were collected from both ESAs and the RSA during the fall of 1995.

Jackrabbits were collected from ESA-1 but not ESA-2 for several reasons. Large numbers of jackrabbits were observed in SWMUs 42/45 (ESA-1) but not in ESA-2, and SWMUs 42/45 provided excellent habitat for the jackrabbits in terms of cover, water, and food source. The Stormwater Discharge Area of SWMU 45 represents an area where contaminants are likely to be concentrated. In addition, SWMUs 12/15 (Pesticide Disposal/Sanitary Landfill) are located nearby and are within the home range of the jackrabbit.

Section 2.2.2 discusses the approach used to select COPCs as analytes for biota analysis. The biota tissue samples were analyzed for selected COPCs. Soil samples that coincided with the vegetation sample locations were also collected and analyzed for COPCs. Results of the soil and biota sampling are discussed in Section 5.0 of this report.

3.3.1 Selection of Sample Locations

The vegetation and co-located soil sample locations within ESA-1 and ESA-2 reflect intentionally biased sampling designs to maximize the probability of encountering contaminated media. The ESA sample locations were chosen in areas with the highest COPC concentrations as determined from previous RI/RFI investigations. In addition, sampling locations were selected based on availability of the selected plant and animal species and on their close proximity. The soil and vegetation sampling locations at the off-site RSA location were based upon abundance and distribution of selected vegetation species.

Grasshopper and beetle sample locations were selected adjacent to or as near as possible to the

vegetation/co-located soil sample locations. Actual locations were dependent on the quantity of grasshoppers available for collection. The collection of terrestrial invertebrates is discussed in greater detail in Section 3.4.4.

Benthos sample locations for SWMU 14 were selected so that the collection of invertebrates was most representative of the entire lagoon. Actual sample locations were changed in the field to areas closer to shore than originally selected because of high winds that prohibited the use of a boat on the lagoon.

The sample locations chosen for ESA-1 and ESA-2 are shown in Figures 5-1 through 5-7 in Section 5.0. Information on the COPCs that are present in the co-located soil samples are included in Appendix D; the analytical results are summarized in Section 5.0. All biota sample results are located in Appendix E; the analytical results are summarized in Section 5.0. Also, summary statistics on the historical data from previous samples at these locations are summarized by SWMU in Appendix B.

3.3.2 Determination of Sample Size

The volume or mass of samples to be collected was evaluated to ensure that the sample size was adequate so that statistically valid decisions could be made from comparisons of samples taken from the ESAs and from the RSA. The limits of decision error and statistical basis for the sample numbers are discussed in Section 2.5.3 of the SWEAP/QAPjP (Rust E&I 1994c). Table 3-1 summarizes the types and numbers of samples taken from each ESA and the RSA.

Except for gumweed and invertebrates, the sample volumes presented in Table 3-2 provided sufficient sample material for all analyses and allowed for statistically valid comparisons between the TEAD samples and the RSA samples. Method detection limit (MDL) studies on gumweed were limited to three replicates instead of the customary seven because of the limited amount of sample material. MDL studies were conducted on grasshoppers obtained from a scientific supply house, which provided sufficient sample material for all seven replicates. Refer to Section 4.0 for a discussion of the analytical program summary and MDL studies.

3.3.3 Vegetation and Co-located Soil Sampling

Vegetation sampling was started at the beginning of the field effort in the fall of 1994 prior to soil sampling in order to determine and mark locations within a 5-meter-radius circle. Rubber rabbitbrush, kochia, and yellow sweetclover were originally selected as suitable tissue sample species because of their positions in the food web. However, Sandberg's bluegrass, ambrosia, curlycup gumweed, and sand dropseed were used as substitutes when the primary plants could not be found in the area. Due to the limited amount of kochia in the selected sample locations, curlycup gumweed was collected for analysis. A limited amount of ambrosia, bluegrass, and sand dropseed was collected. These species are also used as forage by primary consumers.

Table 3-1. TEAD SWERA Co-located Soil and Biota Sample Collection

Sample Type	ESA[a]-1 Planned	Actual	ESA-2 Planned	Actual	ESA-3 Planned	Actual	RSA[b] Planned	Actual	Total Actual
Vegetation									
Rabbitbrush	0	**14**	15	**15**	0	**0**	15	**15**	**44**
Gumweed	0	**4**	0	**10**	0	**0**	0	**7**	**21**
Sandberg's Bluegrass	0	**1***	0	**0**	0	**0**	0	**0**	**1**
Ambrosia	0	**0**	0	**2****	0	**0**	0	**0**	**2**
Sweetclover	15	**11**	15	**5**	0	**0**	15	**15**	**31**
Kochia	15	**1**	0	**0**	0	**0**	15	**15***	**16**
Sand dropseed	0	**0**	0	**2***	0	**0**	0	**0**	**2**
Small Mammals									
Jackrabbit	15	**15**	0	**0**	0	**0**	15	**15**	**30**
Invertebrates									
Grasshopper	0	**4†**	15	**17†**	0	**0**	15	**11†**	**32†**
Beetle	0	**2†**	0	**7†**	0	**0**	0	**4†**	**13†**
Benthos[c]	0	**0**	0	**0**	8	**8**	0	**0**	**8**
Soil/Sediment									
Soil (Co-located)	15	**15**	15	**15**	0	**0**	15	**16**	**46**
Totals	60	**67**	60	**73**	8	**8**	90	**98**	**246**

†Grasshopper and beetle samples were composited by SWMU grouping (e.g. 10/11, 12/15, etc.) due to lack of invertebrates available for collection. * Collected but not chemically analyzed. ** One of the two samples was analyzed due to the absence of a suitable vegetation substitute in that location.

[a]Ecological study area.

[b]Reference study area.

[c]Eight samples were taken for visual examination and description at ESA-3 (SWMU 14 Sewage Lagoons).

Table 3-2. Sample Size Requirements

Sample Type	Gross or Composite Sample (wet weight, grams)	Metals (grams)	Pesticides/ PCBs[a] (grams)	Dioxins/ Furans (grams)	Explosives (grams)	SVOCs/ PAHs[b] (grams)	Herbicide/ 2,4-D
Jackrabbit	1,000	10/2[c]	10	10	--	10	1
Grasshopper /Beetle	50-75	5/1	10	10	--	--	--
Vegetation	100	10/2	10	10	10	10	1
Benthos	NA	NA[d]	NA	NA	NA	NA	--
Soil[e]	500	100	100	100	100	100	--

[a]Polychlorinated biphenyls.
[b]Semi-volatile organic compounds/polynuclear aromatic hydrocarbons.
[c]Estimated sample requirement for a suite/individual analysis; e.g., 10 grams for ICP-metals, 2 grams for antimony (Sb) by GFAA.
[d]NA is not applicable.
[e]Soil sampling and analysis were conducted per USATHAMA and DataChem Laboratory protocols.
"--" Analysis not performed.

The radius of the circle was extended from 5 meters to 10 meters on occasions when the quantity of the sample needed to be increased to fulfill the sampling requirement of at least 100 grams per sample. The vegetation was harvested using powderless nitrile gloves and clipping shears rinsed with distilled water between each composited sample. Both stem and leaf material were collected from each plant. The required quantity of vegetation was placed in a brown paper bag (vegetation species were never mixed) and weighed on an Ohaus triple-beam balance. Because there was no corresponding RSA material for comparison, bluegrass and sand dropseed samples were not analyzed for COPCs, but were reserved for later analysis if deemed necessary. MDL studies were conducted on sweetclover, gumweed, and rubber rabbitbrush due to the availability of sample material.

Each plant type was designated by a letter marked on each pin flag: "K" for kochia, "C" for sweetclover, "B" for rabbitbrush, "M" for gumweed, "A" for ambrosia, "U" for bluegrass, and "D" for sand dropseed. A pin flag was then inserted into the ground at the desired sample locations. The flags were left at each location so that soil samples could be co-located with each species. Table 3-3 provides a summary of vegetation and co-located soil samples collected by SWMU.

Composite soil samples were collected following collection of the vegetation samples. All soil samples were collected from the area at the base of the collected vegetation using a hand auger to a depth of 12 inches. The amount of soil taken from each location was determined by the number of plants sampled at that location. The standard procedure used when taking soil samples was as follows: a soil sample was taken using a stainless-steel auger at each pin flag location except when another pin flag was within a 1-foot radius, in which case one sample would be taken for both locations. The auger barrel was then emptied into a 5-gallon stainless-steel bucket and homogenized. The amount of soil transferred from the bucket into a

Table 3-3. Summary of Co-located Soil and Vegetation Sample Collection

Location Sample ID Code	Co-located Soil Sample Nos. S	Number and Type of Vegetation Samples Collected: Ambrosia A	Bluegrass U	Sweetclover C	Gumweed M	Kochia K	Rabbitbrush B	Sand Dropseed D
SWMU 42	ES1-94-01			EC1-94-01			EB1-94-01	
	ES1-94-02			EC1-94-02			EB1-94-02	
	ES1-94-03			EC1-94-03			EB1-94-03	
	ES1-94-04			EC1-94-04			EB1-94-04	
	ES1-94-05			EC1-94-05			EB1-94-05	
	ES1-94-06			EC1-94-06			EB1-94-06	
	ES1-94-07		EU1-94-07		EM1-94-07		EB1-94-07	
	ES1-94-08			EC1-94-08			EB1-94-08	
	ES1-94-09			EC1-94-09			EB1-94-09	
Subtotals	**9**	**0**	**1**	**8**	**1**	**0**	**9**	**0**
SWMU 45	ES2-94-01				EM2-94-01	EK2-94-01		
	ES2-94-02				EM2-94-02		EB2-94-02	
	ES2-94-03			EC2-94-03			EB2-94-03	
	ES2-94-04				EM2-94-04		EB2-94-04	
	ES2-94-05			EC2-94-05			EB2-94-05	
	ES2-94-06			EC2-94-06			EB2-94-06	
Subtotals	**6**	**0**	**0**	**3**	**3**	**1**	**5**	**0**
SWMU 1b	ES3-94-01				EM3-94-01		EB3-94-01	ED3-94-01
	ES3-94-02				EM3-94-02		EB3-94-02	ED3-94-02
Subtotals	**2**	**0**	**0**	**0**	**2**	**0**	**2**	**2**
SWMU 1c	ES4-94-01				EM4-94-01		EB4-94-01	
	ES4-94-02				EM4-94-02		EB4-94-02	
Subtotal	**2**	**0**	**0**	**0**	**2**	**0**	**2**	**0**

Table 3-3. Summary of Co-located Soil and Vegetation Sample Collection (continued)

Location Sample ID Code	Co-located Soil Sample Nos. S	Number and Type of Vegetation Samples Collected						
		Ambrosia A	Bluegrass U	Sweetclover C	Gumweed M	Kochia K	Rabbitbrush B	Sand Dropseed D
SWMU 10	ES5-94-01				EM5-94-01		EB5-94-01	
	ES5-94-02				EM5-94-02		EB5-94-02	
Subtotals	**2**	**0**	**0**	**0**	**2**	**0**	**2**	**0**
SWMU 11	ES6-94-01	EA6-94-01			EM6-94-01		EB6-94-01	
Subtotals	**1**	**1**	**0**	**0**	**1**	**0**	**1**	**0**
SWMU 12	ES7-94-01			EC7-94-01			EB7-94-01	
Subtotals	**1**	**0**	**0**	**1**	**0**	**0**	**1**	**0**
SWMU 15	ES8-94-01			EC8-94-01			EB8-94-01	
	ES8-94-02			EC8-94-02			EB8-94-02	
	ES8-94-03				EM8-94-03		EB8-94-03	
Subtotals	**3**	**0**	**0**	**2**	**1**	**0**	**3**	**0**
SWMU 21	ES9-94-01				EM9-94-01		EB9-94-01	
	ES9-94-02				EM9-94-02		EB9-94-02	
Subtotals	**2**	**0**	**0**	**0**	**2**	**0**	**2**	**0**
SWMU 37	ESA-94-01			ECA-94-01			EBA-94-01	
	ESA-94-02	EAA-94-02		ECA-94-02			EBA-94-02	
Subtotals	**2**	**1**	**0**	**2**	**0**	**0**	**2**	**0**
SWMU Totals	**30**	**2**	**1**	**16**	**14**	**1**	**29**	**2**

Table 3-3. Summary of Co-located Soil and Vegetation Sample Collection (continued)

Location Sample ID Code	Co-located Soil Sample Nos. S	Number and Type of Vegetation Samples Collected: Ambrosia A	Bluegrass U	Sweetclover C	Gumweed M	Kochia K	Rabbitbrush B	Sand Dropseed D
RSA	ESB-94-01				EMB-94-01		EBB-94-01	
	ESB-94-02					EKB-94-02	EBB-94-02	
	ESB-94-03					EKB-94-03	EBB-94-03	
	ESB-94-04			ECB-94-04			EBB-94-04	
	ESB-94-05			ECB-94-05	EMB-94-05	EKB-94-05	EBB-94-05	
	ESB-94-06			ECB-94-06	EMB-94-06	EKB-94-06	EBB-94-06	
	ESB-94-07			ECB-94-07			EBB-94-07	
	ESB-94-08*			ECB-94-08			EBB-94-08	
	ESB-94-09*			ECB-94-09			EBB-94-09	
	ESB-94-10			ECB-94-10		EKB-94-10	EBB-94-10	
	ESB-94-11			ECB-94-11	EMB-94-11		EBB-94-11	
	ESB-94-12			ECB-94-12	EMB-94-12	EKB-94-12	EBB-94-12	
	ESB-94-13			ECB-94-13		EKB-94-13	EBB-94-13	
	ESB-94-14			ECB-94-14		EKB-94-14	EBB-94-14	
	ESB-94-15			ECB-94-15	EMB-94-15	EKB-94-15	EBB-94-15	
	ESB-95-16*							
	ESB-94-17			ECB-94-17		EKB-94-17		
	ESB-94-18			ECB-94-18	EMB-94-18	EKB-94-18		
	ESB-94-19			ECB-94-19		EKB-94-19		
	ESB-94-20*					EKB-94-20		
	ESB-94-21*					EKB-94-21		
	ESB-94-22*					EKB-94-22		
RSA Totals	**16**	**0**	**0**	**15**	**7**	**15**	**15**	**0**

*Soil samples not required at these locations.

stainless-steel pan was dependent on how many subsample locations were being composited. This amount ranged from two spoonfuls to all of the material in the auger barrel. The contents of the pan were then homogenized and spooned into the appropriate sample containers, labeled, custody-sealed, bagged and placed in a cooler with Blue Ice™.

3.3.3.1 *ESA-1*

SWMU 42 - Bomb Washout Building

ES1-94-01 was located in an area of scattered debris consisting of rusting nuts, bolts, nails, bullet casings, and miscellaneous automobile parts approximately 220 feet southwest of Building 539. Vegetation was sampled from two rabbitbrush plants and three sweetclover plants. No plants were substituted due to the presence of sufficient material and to the lack of other plant material in the vicinity. Soil was composited from five locations co-located with the vegetation samples. After thoroughly mixing the soil, three scoops of soil from each subsample location were placed into a stainless-steel pan where they were homogenized and composited with the soil taken from the other subsample locations. As with all samples, the soil was then spooned into the appropriate sample containers, labeled, custody-sealed, bagged, and placed in a cooler with Blue Ice™.

ES1-94-02 was located in the drainage approximately 200 feet north of ES1-94-01. Vegetation samples were collected from 2 rabbitbrush plants and from 11 sweetclover bunches. Soil was composited from four locations co-located with the vegetation samples. In order to collect sufficient soil for the duplicate QA/QC sample, six scoops of soil were taken from each subsample location and placed into a stainless-steel pan, where soil collected from the other subsample locations were homogenized and composited together for analysis. No duplicate QA/QC vegetation samples were required to be collected.

ES1-94-03 was also located in the drainage approximately 200 feet northwest of ES1-94-02. Vegetation samples were collected from 2 rabbitbrush plants and from 11 sweetclover bunches. Soil was composited from four locations co-located with the vegetation samples. Four scoops of soil were taken from each subsample location and homogenized.

ES1-94-04 was also located in the drainage approximately 180 feet southeast of ES1-94-02. Vegetation samples were collected from two rabbitbrush plants and from five sweetclover bunches. Soil was composited from five locations co-located with the vegetation samples. Four scoops of soil from each of the four locations were homogenized together for analysis.

ES1-94-05 was located in the drainage approximately 300 feet northwest of ES1-94-02. Vegetation samples were collected from two rabbitbrush plants and from two sweetclover bunches. Soil was composited from four locations co-located with the vegetation samples. Four scoops of soil were taken from each subsample location and homogenized together.

ES1-94-06 was located in the drainage approximately 30 feet northwest of ES1-94-05. Vegetation samples were collected from 2 rabbitbrush plants and 15 sweetclover bunches. Soil was composited from four subsample locations co-located with the vegetation samples. Four scoops of soil were taken from each location and homogenized together for analysis.

ES1-94-07 was located approximately 200 feet northeast of the sample locations in or along the drainage. Bluegrass was collected as a substitute because the sample location was in an area free of kochia and sweetclover. Bluegrass was collected from 40 clumps to achieve the desired quantity of 100 grams. Rabbitbrush was then collected from two plants within the 5-meter-radius circle. At a later date, gumweed was collected from three plants in order to add to the total count of vegetation samples. Co-located soils taken near the gumweed samples, however, were not added to the soil composite. Soil was composited from 12 locations co-located with the vegetation samples. Two scoops of soil from each of the 12 locations were combined and homogenized for analysis.

ES1-94-08 was located just outside of the washout pond, approximately 30 feet west of ES1-94-06. Vegetation samples were collected from two rabbitbrush plants and from three sweetclover bunches. Soil was composited from four locations co-located with the vegetation samples. Three scoops of soil were taken from each of the four subsample locations and homogenized for analysis.

ES1-94-09 was located in the washout pond at the end of the drainage, approximately 70 feet northwest of ES1-94-08. Vegetation samples were collected from two rabbitbrush plants and from eight sweetclover bunches. Soil was composited from three locations co-located with the vegetation samples. Three scoops of soil were taken from each subsample location and homogenized.

SWMU 45 - Stormwater Discharge

The stormwater discharge area is located in a basin that receives more moisture than surrounding areas because of the discharge of stormwater from the administration area into the basin. A small pond receives water from a culvert, but it dries up within a couple of days after it has been filled. Because of the presence of this water, the area is relatively well vegetated and attracts a diverse assemblage of wildlife species.

ES2-94-01 was the sample location farthest to the north at SWMU 45, located approximately 40 feet east of well location N-14. Vegetation samples were collected from 11 kochia plants and, at a later date, from 2 gumweed plants. Soil was composited from three locations co-located with the vegetation samples. Four scoops of soil were taken from each of the three subsample locations and homogenized for analysis.

ES2-94-02 was located approximately 190 feet southeast of ES2-94-01 in an area of thick cheatgrass and rabbitbrush. Vegetation samples were collected from two rabbitbrush plants and, at a later date, from four gumweed plants. Soil was composited from two locations co-located with the vegetation samples. Because there were only two subsample locations, the entire contents of the two auger barrels were used to make up the one composite sample.

ES2-94-03 was located approximately 60 feet southeast of ES2-94-02 also in an area of thick cheatgrass and rabbitbrush. Vegetation samples were collected from three rabbitbrush plants and from six sweetclover plants. Soil was composited from six locations co-located with the vegetation samples. Two scoops of soil each were taken from the bucket and placed into a stainless-steel pan, where soil collected from all six subsample locations was homogenized.

ES2-94-04 was located approximately 50 feet southwest of ES2-94-03 in an area of thick cheatgrass and rabbitbrush close to the discharge point. Vegetation samples were collected from two rabbitbrush plants and from three gumweed plants. Soil was composited from two locations co-located with the vegetation samples. Because there were only two subsample locations, the entire contents of the two auger barrels were used to make up the one composite sample sent out for analysis.

ES2-94-05 was located approximately 45 feet east of ES2-94-04 in an arid area close to a gravel road. Vegetation samples were collected from two rabbitbrush plants and from four sweetclover plants. Soil was composited from five locations co-located with the vegetation samples. Three scoops of soil were taken from each of the five subsample locations and homogenized.

ES2-94-06 was located approximately 60 feet northwest of ES2-94-04 in an arid area on the hillside. Vegetation samples were collected from three rabbitbrush plants and from six sweetclover plants. Soil was composited from six locations co-located with the vegetation samples. Two scoops of soil were taken from each subsample location and composited and homogenized for analysis.

3.3.3.2 *ESA-2*

SWMU 10 - TNT Washout Facility

ES5-94-01 was located approximately 200 feet east of the new TNT washout pond in a sandy area with a synthetic liner approximately 6 inches under the surface. The sample was located on the edge of the liner. Vegetation samples were collected from three rabbitbrush plants and from three gumweed plants. Soil was composited from six locations co-located with the vegetation samples. Four scoops of soil were taken from each of the six locations and homogenized.

ES5-94-02 was located approximately 200 feet northeast of the new TNT washout pond, also in a sandy area. Vegetation samples were collected from two rabbitbrush plants and from six gumweed plants. Soil was composited from seven locations co-located with the vegetation samples with two scoops of soil taken from each subsample location to make up the composite.

SWMU 11 - Laundry Effluent Ponds

ES6-94-01 was located in the trash pile area approximately 1,300 feet northeast of the new TNT washout pond. Vegetation samples were collected from one rabbitbrush plant, four ambrosia plants, and three gumweed plants. The nearest gumweed plants were found 130 feet N 75° E of the original sample location. Soil was composited from five locations co-located with the vegetation samples. Four scoops of soil were taken from each of the five subsample locations and homogenized.

SWMU 12 - Pesticide Disposal Area

ES7-94-01 was located approximately 400 feet west of the asbestos disposal area. Vegetation samples were collected from two rabbitbrush plants and from two sweetclover plants. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the six subsample locations and homogenized.

SWMU 15 - Sanitary Landfill

ES8-94-01 was located approximately 800 feet southeast of ES2-94-03 in the natural drainage that runs through the sanitary landfill area. Vegetation samples were collected from one rabbitbrush plant and from three sweetclover plants. Soil was composited from three locations co-located with the vegetation samples. Two scoops of soil were taken from each of the three locations and homogenized.

ES8-94-02 was located in a gravelly area at the far northern edge of the sanitary landfill. Vegetation samples were collected from one rabbitbrush plant and from two sweetclover plants. Soil was composited from three locations co-located with the vegetation samples. Two scoops of soil were taken from each of the three subsample locations to make up the one composite sample.

ES8-94-03 was located approximately 850 feet southeast of ES8-94-02 in a gravelly area. Vegetation samples were collected from one rabbitbrush plant and from three gumweed plants. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the four subsample locations and homogenized.

SWMU 1b - Burn Pads

ES3-94-01 was located at the northern end of SWMU 1b. Vegetation samples were collected from three rabbitbrush plants and from two sand dropseed plants. The sample radius was extended to 10 meters to acquire enough sample material. Gumweed was sampled from three plants 450 feet due east as there were no plants found in the original sample area. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the four subsample locations and homogenized together.

ES3-94-02 was located approximately 700 feet southeast of ES3-94-01. Vegetation samples were collected from 2 rabbitbrush plants and from 10 sand dropseed plants. Gumweed was collected from five plants at a later date in order to add to the total count of vegetation samples. Soil was composited from 11 locations co-located with the vegetation samples. Two scoops of soil were taken from each of the 11 subsample locations and homogenized for the composite sample.

<u>SWMU 1c - Trash Burn Pits</u>

ES4 -94-02 was located approximately 1,200 feet southeast of ES3-94-02. Vegetation samples were collected from three rabbitbrush plants and from five gumweed plants. Soil was composited from seven locations co-located with the vegetation samples. Two scoops of soil were taken from each of the seven subsample locations and homogenized together to form the composite sample.

ES4-94-01 was located approximately 600 feet west of ES4-94-02. Vegetation samples were collected from one rabbitbrush plant and from four gumweed plants. The sample radius was extended to 10 meters in order to collect enough sample material. Soil was composited from five locations co-located with the vegetation samples. Two scoops of soil were taken from each of the six subsample locations and homogenized.

<u>SWMU 21 - AED Deactivation Furnace Building</u>

ES9-94-01 was located near a culvert that controls runoff from the front of the building. Vegetation samples were collected from two rabbitbrush plants and from approximately three gumweed plants. Soil was composited from two locations co-located with the vegetation samples. Because there were only two subsample locations, the entire contents of the two auger barrels were used to make up the one composite sample submitted for analysis.

ES9-94-02 was located 40 feet northeast of ES9-94-01 outside the fenced area. This location was chosen because of available vegetation and its proximity to the building. Vegetation samples were collected from one rabbitbrush plant and two gumweed plants. Soil was composited from two locations co-located with the vegetation samples. Because there were only two subsample locations, the entire contents of the two auger barrels were used to make up the one composite sample submitted for analysis.

<u>SWMU 37 - Contaminated Waste Processor</u>

ESA-94-01 was located 25 feet east of Building 1325B. Vegetation samples were collected from three rabbitbrush plants and nine sweetclover plants. The sweetclover had recently been mown, but there were numerous short stalks from which to collect samples. Soil was composited from 11 locations co-located with the vegetation samples. Two scoops of soil each were taken from each of the 11 subsample locations and homogenized.

ESA-94-02 was moved from its original proposed location to approximately 100 feet northwest of Building 1325B because of lack of vegetation. The radius of the circle was extended to 10 meters to collect enough sweetclover for the desired sample weight of 100 grams (net). Vegetation samples were collected from 3 rabbitbrush plants, 5 ambrosia plants, and 14 sweetclover plants. Soil was composited from 18 locations co-located with the vegetation samples. Two scoops of soil were taken from each of the 18 subsample locations and homogenized together for the composite sample.

3.3.3.3 *Reference Study Area*

The sample locations at the RSA were chosen by locating areas containing the desired vegetation species for collection. The distribution of the vegetation species of interest was scattered over a large area. As such, no random sampling grid was used. The samples that were collected are representative of the large area included in the RSA.

ESB-94-01 was located approximately 200 feet north of the area used for quantitative surveys. Vegetation samples were collected from three rabbitbrush plants and six gumweed plants. Soil was composited from three locations co-located with the vegetation samples. Two scoops of soil were collected from each of the three subsample locations and homogenized together.

ESB-94-02 was also located north of the transect grid location by approximately 200 feet. Vegetation samples were collected from two rabbitbrush plants and two kochia plants. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the four subsample locations and combined to form the composite.

ESB-94-03 was also located just north of the transect grid location. Vegetation samples were collected from two rabbitbrush plants and two kochia plants. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the four subsample locations and homogenized together.

ESB-94-04 was located north approximately 1½ miles along the paved road from the first three sample locations. Vegetation samples were collected from one rabbitbrush plant and one kochia plant. Soil was composited from two locations co-located with the vegetation samples. Because there were only two subsample locations, the entire contents of the two augers were used to form the composite sample submitted for analysis.

ESB-94-05 was located north approximately 500 yards from ESB-94-04 and approximately 40 yards west of the paved road. Vegetation samples were collected from two rabbitbrush plants, two sweetclover plants, and two kochia plants. Gumweed was also sampled from approximately three plants at a later date to satisfy the sampling requirements. Soil was composited from six locations co-located with the vegetation samples. Two scoops of soil were taken from each of the six subsample locations to form the composite.

ESB-94-06 was located just north (approximately 20 feet) of ESB-94-05 across a small gravel road. Vegetation samples were collected from two rabbitbrush plants, two sweetclover plants, and two kochia plants. Gumweed was also sampled from approximately two plants at a later date to satisfy the sampling requirements. Soil was composited from five locations co-located with the vegetation samples. Two scoops of soil were taken from each of the five subsample locations and homogenized together. A duplicate soil sample (ESB-94-06 D) was also taken at this location.

ESB-94-07 was located near the gravel road approximately 20 feet away from ESB-94-06. Vegetation samples were collected from one rabbitbrush plant and three sweetclover plants. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the four subsample locations and homogenized.

ESB-94-08 was located approximately 150 feet southeast of ESB-94-07 across the paved road. Vegetation samples were collected from two rabbitbrush plants and three sweetclover plants. Although this location was available for soil sampling, no soil samples were collected because the necessary number of soil samples had already been collected.

ESB-94-09 was located approximately 50 feet south of ESB-94-08. Vegetation samples were collected from approximately two rabbitbrush plants and three sweetclover plants. There were no soil samples collected at this location because the necessary number of soil samples had already been collected.

ESB-94-10 was located approximately 75 feet northeast of ESB-94-08. Vegetation samples were collected from approximately two rabbitbrush plants, two sweetclover plants, and two kochia plants. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the four subsample locations to form the composite sample.

ESB-94-11 was located approximately 200 feet north of ESB-94-08. Vegetation samples were collected from one rabbitbrush plant and one sweetclover plant. Gumweed was also sampled from approximately two plants at a later date to satisfy the sampling requirements. Soil was composited from two locations co-located with the vegetation samples. Because there were only two subsample locations, the entire contents of the auger were used to form the composite sample submitted for analysis.

ESB-94-12 was located along the west side of Rush Lake. Vegetation samples were collected from two rabbitbrush plants, two sweetclover plants, and two kochia plants. Soil was composited from six locations co-located with the vegetation samples. Two scoops of soil were taken from each of the six subsample locations and homogenized.

ESB-94-13 was located along the west side of Rush Lake approximately 300 feet north of ESB-94-12. Vegetation samples were collected from two rabbitbrush plants, two sweetclover plants, and two kochia plants. Soil was composited from six locations co-located with the vegetation samples. Two scoops of soil were taken from each of the six subsample locations to form the composite.

ESB-94-14 was located along the west side of Rush Lake approximately 250 feet north of ESB-94-13. Vegetation samples were collected from two rabbitbrush plants, two sweetclover plants, and two kochia plants. Soil was composited from six locations co-located with the vegetation samples. Two scoops of soil were taken from the six subsample locations and homogenized.

ESB-94-15 was located along the west side of Rush Lake approximately 250 feet north of ESB-94-14. Vegetation samples were collected from two rabbitbrush plants, two sweetclover plants, and two kochia plants. Soil was composited from six locations co-located with the vegetation samples. Two scoops of soil were taken from each of the six subsample locations to form the composite.

ESB-94-17 was located along the west side of Rush Lake approximately 100 feet north of ESB-94-18. Vegetation samples were collected from two sweetclover plants and two kochia plants. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the four subsample locations and homogenized together.

ESB-94-18 was located along the west side of Rush Lake approximately 1/4-mile south of ESB-94-12. Vegetation samples were collected from two sweetclover plants and two kochia plants. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the four subsample locations to form the composite.

ESB-94-19 was located along the west side of Rush Lake approximately 100 feet south of ESB-94-18. Vegetation samples were collected from two sweetclover plants and two kochia plants. Soil was composited from four locations co-located with the vegetation samples. Two scoops of soil were taken from each of the four subsample locations and homogenized.

EKB-94-20 was located along the gravel road next to the gravel pit located approximately 3 miles southwest of the Rush Lake sampling locations. Kochia was collected to add to the total count of vegetation samples. There were no soil samples collected at this location because the necessary number of soil samples had already been collected.

EKB-94-21 was located approximately 50 feet west of EKB-94-20. Kochia was collected to add to the total count of vegetation samples. There were no soil samples collected at this location because the necessary number of soil samples had already been collected.

EKB-94-22 was located approximately 50 feet west of EKB-94-21. Kochia was collected to add to the total count of vegetation samples. There were no soil samples collected at this location because the necessary number of soil samples had already been collected.

3.3.4 Sampling of Black-tailed Jackrabbits

Black-tailed jackrabbits were selected for tissue sampling because they (1) are strictly herbivorous, (2) have a widespread distribution throughout TEAD (including maintenance and

administration areas), (3) presently occur in large numbers, and (4) potentially are a major contributor of contaminant movement via bioaccumulation through the food chain to predators and raptors.

As discussed in Section 2.2.3.1, the home range used for the black-tailed jackrabbit was 103 acres, integrating a large area of both contaminated and non-contaminated media in or around the ESA. Figure 3-3 shows this home range using a 1,200-foot-radius circle to depict the area around each SWMU. These circles were initially intended to be used as the sampling boundaries for SWMUs 42 and 45 but, when trapping methods failed, the periphery of these initial boundaries was increased to ensure an adequate sample collection. Appendix C provides a detailed summary table on the jackrabbit sampling activity.

3.3.4.1 *SWMU 42 - Bomb Washout Building and SWMU 45 - Stormwater Discharge Area*

Trapping

Even though numerous traps were baited and set, no jackrabbits were collected at SWMU 42. Traps were set along the natural drainage pathway where there was abundant cover, and baited with alfalfa pellets, vegetables, and fruit. Two types of traps were used: the 26-by-9-by-9-inch Tomahawk Live Trap and 60-by-20-by-26-inch dog traps. These traps were placed along rabbit runs and camouflaged with surrounding vegetation. The traps were left in place from 3 to 4 days, frequently re-baited, and checked daily. Traps were also set in SWMU 45 along the natural drainage pathway at the stormwater discharge area and around the vehicles parked in the lot south and west of Building 576. No jackrabbits were caught in the traps at SWMU 45 either; however, one cottontail rabbit was caught and released.

Hunting

Due to the lack of success with the animal traps, approval was obtained from TEAD and the USAEC to collect jackrabbits using an air rifle. Fifteen jackrabbits were collected at SWMU 45 using two .177 caliber air rifles that expel a single pellet at 800 to 1,000 feet per second. Security officials from TEAD escorted Rust E&I hunting personnel at all times when on TEAD, and the guns were stored at the security building when not being used. Personnel first located jackrabbits in a parking lot west and south of Building 576 and then approached in a safe manner, making sure nothing was in the crossfire. When the jackrabbit was in an unobstructed, safe location, the shot was taken. Eleven of the fifteen rabbits were dispatched on the afternoon of October 11, 1994, and the other four at dusk that same day. Figure 3-3 shows the approximate locations where each jackrabbit was collected. After each rabbit was dispatched by one or more pellets, it was placed in a large, brown paper bag and sealed in a large Zip-loc type polyethylene bag. The bag was properly labeled, custody-sealed, and placed in a cooler containing Blue Ice™. A chain-of-custody (CoC) form was started as soon as the first rabbit was put into the cooler. This procedure was the standard method used when collecting all jackrabbits. Jackrabbits were not shot at SWMU 42 because none were observed at that location.

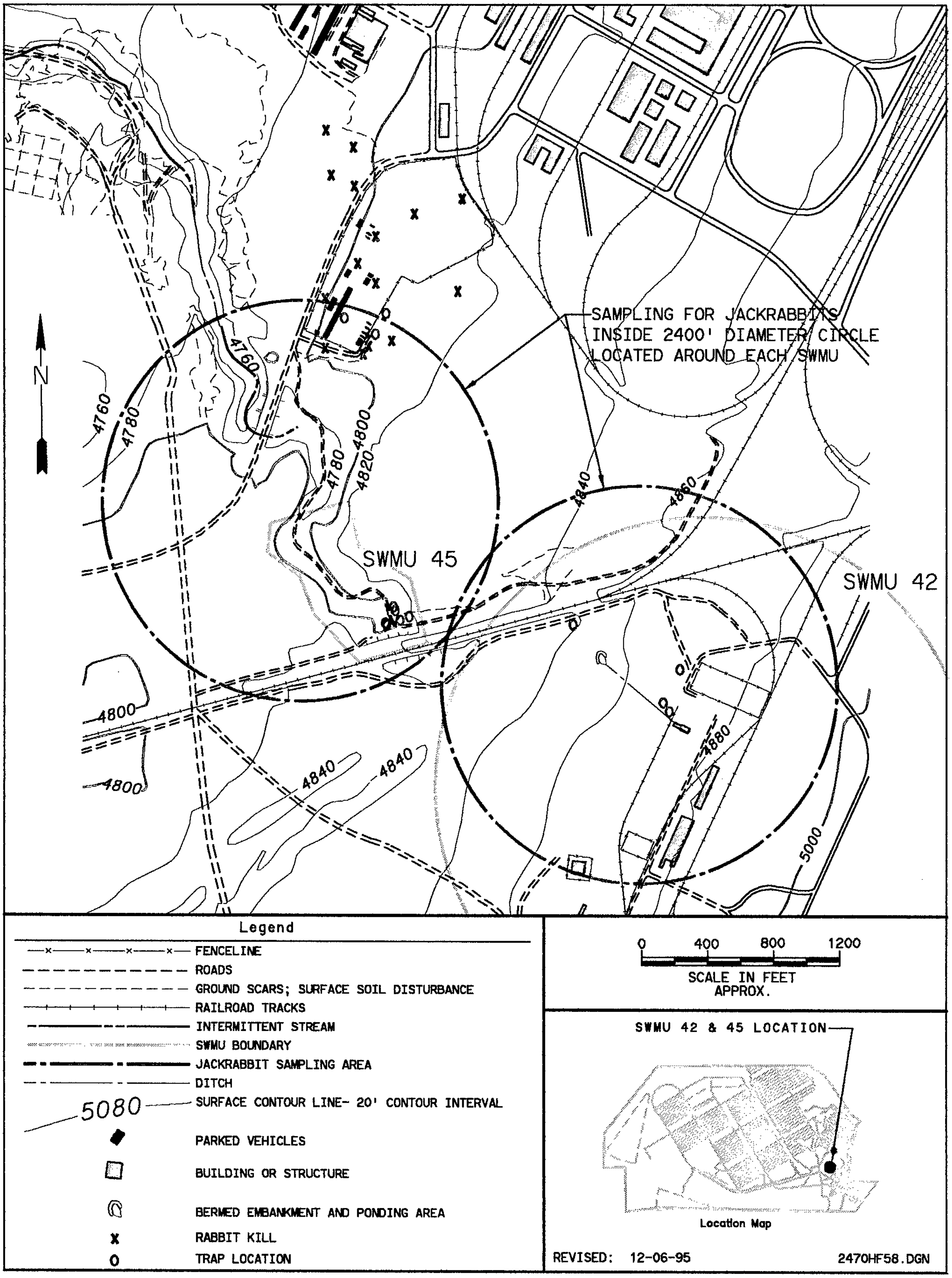

Figure 3-3. Jackrabbit Home Range and Trapping Locations at Bomb Washout Building/Stormwater Discharge (SWMUs 42/45)

3.3.4.2 *Reference Study Area*

Rust E&I personnel scouted for jackrabbit sampling locations in the Rush Valley area starting on October 8, 1994, while collecting vegetation samples. Farmers in the area were asked about the jackrabbit population and potential hunting locations. All responses were negative; there were fewer jackrabbits that year (1994) compared to the previous 2 years presumably due to the cyclical nature of the black-tailed jackrabbit population. Contact was made with the local sheriff department to determine whether or not spotlighting could be conducted. Mr. Leeland Hogan, a county commissioner, was contacted to grant special permission to spotlight jackrabbits for research projects. The original Tooele County ordinance was amended on October 25,1994, allowing permits to be obtained for short periods for legitimate research projects.

Trapping

Two large dog traps were placed in two locations at the RSA on October 12, 1994, as shown in Figure 3-4. These traps were baited with alfalfa pellets, lettuce, spinach leaves, bananas, and apples at different times to determine the most effective bait. The traps were baited and left sprung, or closed for a few days so the rabbits could get use to a new object introduced into their environment. Rabbitbrush and sagebrush was used to camouflage the cage to blend in with the surroundings. Once the preferred bait was determined, the traps were checked and re-baited each morning. It was apparent that the alfalfa pellets and bananas were being eaten, but the traps were not being sprung. Flour was sprinkled around the trap to determine what animals were eating the bait. Small footprints probably from field mice, kangaroo rats, and chipmunks were observed in the flour. On one occasion, a chipmunk was observed running out of a trap as it was approached. The chipmunks were not as heavy as the jackrabbits and, thus, were not able to spring the trap.

Hunting

The RSA area was hunted during the daytime from October 8, 1994 through November 3, 1994 with no success collecting jackrabbits. On October 27, 1994, the first jackrabbit was trapped in trap # 2. The rabbit was dispatched by air rifle while in the cage. Trap # 2 was moved to a new location (Figure 3-4), where it was camouflaged and re-baited. One week after the first jackrabbit was trapped, the second (and final) rabbit was trapped in trap # 2 at the new location. It was dispatched while in the cage and handled appropriately.

Spotlighting

A spotlighting permit was issued to Rust E&I on October 28, 1994. The permit stipulated that spotlighting was not permitted while hunting season was in effect in the same area.

The use of spotlighting was started on October 30, 1994, with a total of three jackrabbits seen and none collected. Eight jackrabbits were seen the next day, but only two jackrabbits were collected. A total of 11 jackrabbits was seen while driving around before nightfall on November 1, 1994, and 7 jackrabbits were collected. A jackrabbit was also trapped that same night.

Because snow had fallen the night of November 1, 1994, and during the following day, the jackrabbits became inactive and difficult to locate. Three rabbits were shot early in the morning, and the last rabbit was shot later that night. Figure 3-4 shows the approximate locations of each jackrabbit collected.

3.3.5 Sampling of Terrestrial Invertebrates

Grasshoppers were not sampled in the Fall of 1994 as planned since populations of grasshoppers were diminished both at TEAD and the RSA due to the lateness of the sampling season. Grasshoppers were abundant during the earlier part of summer 1994; however, approval to begin sampling was not received until late August. Grasshopper collection was subsequently scheduled for late summer 1995. Because of unusually warm and dry winter 1994-1995 weather conditions, which resulted in diminished grasshopper populations, collection of grasshopper and beetles was delayed until the late summer and early fall of 1995. Composite samples of both grasshoppers and beetles were collected at the following SWMUs: 1b/1c, 10/11, 12/15, 21/37, 42/45, and the RSA. The samples were composited due to the lack of ample amounts of insects for collection. HES composited the samples at the lab for analysis. The number and type of composite samples are shown in Table 3-4.

3.4 DEVIATIONS FROM THE FINAL SWEAP/QAPjP (11/94)

This section provides a summary of deviations from the approved work plans during the field investigation phase of the SWERA at TEAD. Most deviations from the SWEAP were a direct result of changes in conditions encountered while conducting the fieldwork. This often resulted in the need to modify a specific standard operating procedure at the time the work was being performed. The USAEC was notified of major deviations from approved procedures, and the proposed changes to the procedures were submitted (verbally or in writing) for USAEC approval prior to implementation.

3.4.1 Jackrabbit Collection Procedures

The original procedure proposed for the collection of jackrabbits at TEAD and the RSA was the use of live traps using grain (i.e., rolled oats) as bait, followed by dispatch in a closed bag using CO_2 as an asphyxiant. Repeated attempts at trapping jackrabbits using this method failed with the exception of two jackrabbits trapped within the RSA. Different baits, such as fresh produce, alfalfa pellets, peanut butter, and fruit were used; the size of the traps was increased; and trap locations were changed in an attempt to capture jackrabbits utilizing the live trap method as specified in the SWEAP/QAPjP.

Due to the general failure of this method after several days of setting and checking the traps, it was determined that the use of a pellet gun equipped with a scope would be an acceptable

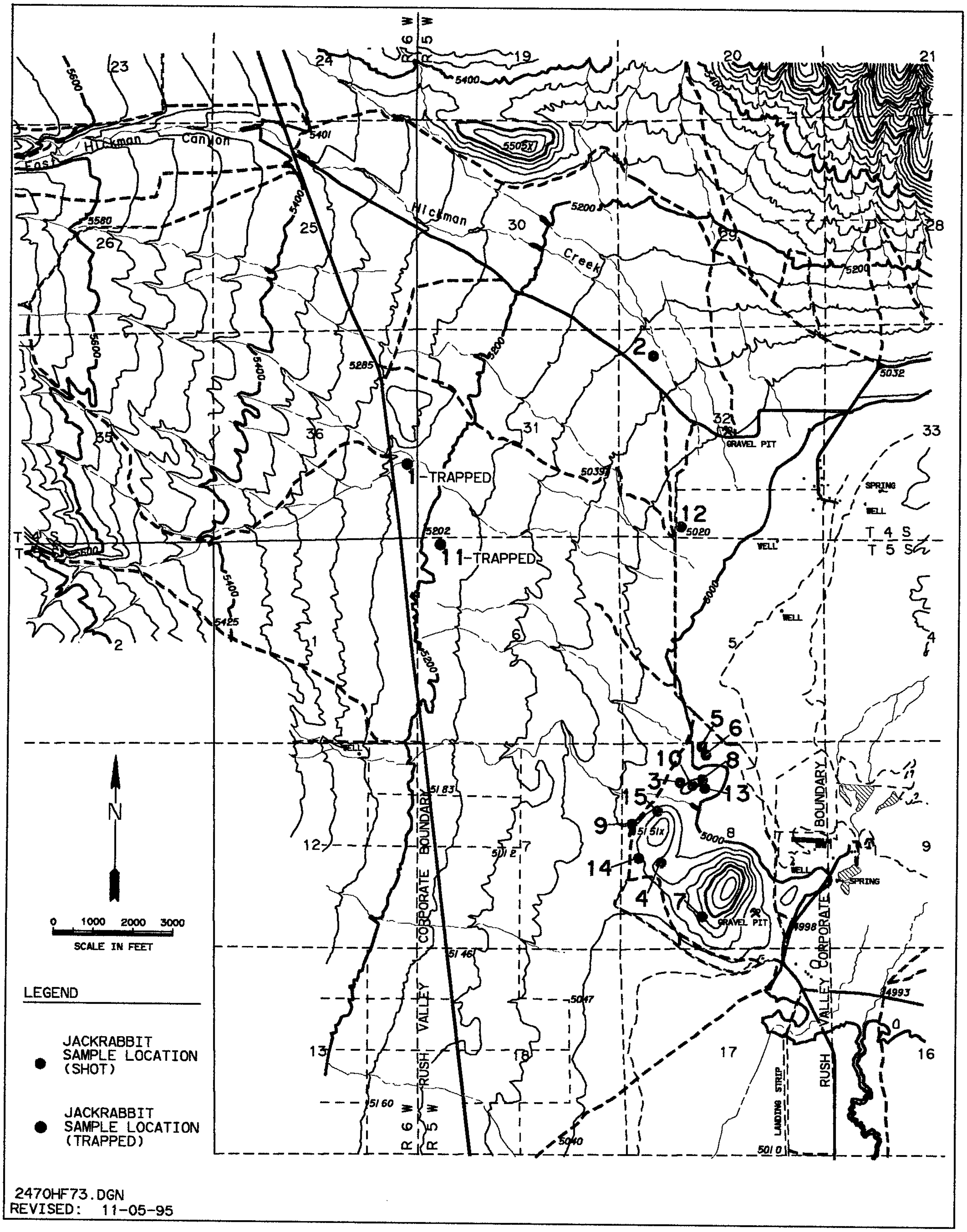

Figure 3-4. Jackrabbit Collection Locations at the Reference Study Area (RSA)

Table 3-4. Number and Type of Invertebrate Samples Collected

SWMU	Matrix	Composite Sample ID	No. of Insects	Weight (grams)	No. Samples	Type
1b/1c	grasshopper	EG3-95-01C	94	34.1	3	grasshopper
	grasshopper	EG3-95-02C	102	34.4	1	beetle
	grasshopper	EG3-95-03C	59	18.1		
	beetle	EL3-95-01C	13	12.5		
10/11	grasshopper	EG5-95-01C	88	34.1	4	grasshopper
	grasshopper	EG5-95-02C	89	34	3	beetle
	grasshopper	EG5-95-03C	93	34.1		
	grasshopper	EG5-95-04C	24	10.7		
	beetle	EL5-95-01C	47	34.1		
	beetle	EL5-95-02C	71	34		
	beetle	EL5-95-03C	37	18.4		
12/15	grasshopper	EG7-95-01C	32	34.2	5	grasshopper
	grasshopper	EG7-95-02C	31	35.3	1	beetle
	grasshopper	EG7-95-03C	34	34.4		
	grasshopper	EG7-95-04C	31	34.6		
	grasshopper	EG7-95-05C	48	36.8		
	beetle	EL7-95-01C	76	29.8		
21/37	grasshopper	EG9-95-01C	60	34.1	5	grasshopper
	grasshopper	EG9-95-02C	60	34.2	2	beetle
	grasshopper	EG9-95-03C	62	34.2		
	grasshopper	EG9-95-04C	69	34.3		
	grasshopper	EG9-95-05C	16	9		
	beetle	EL9-95-01C	52	34.2		
	beetle	EL9-95-02C	25	21.1		
42/45	grasshopper	EG1-95-01C	50	34.4	4	grasshopper
	grasshopper	EG1-95-02C	46	34.5	2	beetle
	grasshopper	EG1-95-03C	55	35.8		
	grasshopper	EG1-95-04C	36	17		
	beetle	EL1-95-01C	110	34.2		
	beetle	EL1-95-02C	65	23.6		
RSA	grasshopper	EGB-95-01C	52	34.8	11	grasshopper
	grasshopper	EGB-95-02C	48	35.4	4	beetle
	grasshopper	EGB-95-03C	54	35.1		
	grasshopper	EGB-95-04C	45	34.5		
	grasshopper	EGB-95-05C	45	34.4		
	grasshopper	EGB-95-06C	59	34.4		
	grasshopper	EGB-95-07C	49	35		
	grasshopper	EGB-95-08C	50	35.1		
	grasshopper	EGB-95-09C	64	34.2		
	grasshopper	EGB-95-10C	57	34.4		
	grasshopper	EGB-95-11C	24	12.8		
	beetle	ELB-95-01C	115	34.7		
	beetle	ELB-95-02C	97	34.2		
	beetle	ELB-95-03C	101	34.2		
	beetle	ELB-95-04C	44	14.9		

alternative method for jackrabbit collection. To minimize the potential for contamination of the samples, field personnel were instructed to use stainless-steel pellets. This method of collection involved obtaining special permits and variances from Army, State, and local regulations, including a local permit to "spotlight" in the RSA at night. Daytime hunting of the rabbits at the RSA proved to be difficult due to their quickness and abundant cover (i.e., sagebrush and rabbitbrush); in addition, TEAD restricted hunting on the facility to "after hours" due to personnel safety concerns.

Hunting of jackrabbits at night with a spotlight proved to be a successful technique, and the proposed number of jackrabbits was collected. Following sample collection, however, it was determined that lead pellets had been inadvertently purchased and used. As a result, following skin removal at the laboratory, the rabbits were probed for any residual pellets. Any pellets present were extracted from the samples prior to analysis. In addition, the area representing pellet entry or exit for all samples was rinsed with distilled, deionized water. However, MDL studies and subsequent analyses showing elevated lead levels indicate that not all of the pellets were removed or that smearing of lead in the tissue during pellet entry may have occurred and that rinsing alone was ineffective for lead removal. The potential impacts of the lead pellets on data quality are discussed in more detail in Section 4.5.3.5 and 7.6.4. It should be pointed out, however, that jackrabbit hunting does occur at the RSA, and the possibility exists that much of the lead can be attributed to previous injuries which healed over, leaving residual lead shot embedded in scar tissue.

Other deviations noted for jackrabbit collection procedures included a change from skinning and determination of weight and sex in the field to skinning and determination of these parameters in the laboratory. This change did not affect data quality.

3.4.2 Vegetation Sample Collection

Several types of vegetation were present at the RSA but not at the ESAs and vice versa. These vegetation types were sampled but not analyzed due to a lack of the same vegetation at each area for comparison of results. These included kochia, sand dropseed, bluegrass, and ambrosia (although one ambrosia sample was analyzed at SWMU 37 since no other plant material was present). The vegetation collected and analyzed that are common to all areas were limited to rabbitbrush, sweetclover, and gumweed. Of these three, only sweetclover appears to be representative of primary plants within the jackrabbit's diet at the time of sample collection. Rabbitbrush is eaten by the jackrabbit primarily in the winter months and comprises only 10 to 15 percent of the animal's diet. Gumweed does not appear to be a significant part of the jackrabbit's diet. This fact subsequently limited the strength of the vegetation data used to assess the potential effects of ingestion of SWMU-specific contaminants by jackrabbits.

3.4.3 Benthos Sample Collection

The procedure for the collection of benthic macroinvertebrates from the sewage lagoons at TEAD originally called for the use of a boat, tether line, and a pole-mounted dredge sampler

with messenger for obtaining benthic materials from the lagoon bottom at specified grid locations. However, high winds and shallow lagoon depth at the time of sampling prevented the use of the boat. Actual collection of benthic samples was accomplished by personnel wearing hip waders, wading 8 to 12 feet into the lagoon from the shoreline, and collecting the samples with a polyethylene scoop attached to a long handle. As a result, samples from the middle of the lagoon were not collected. Additionally, a No. 35 mesh sieve was to be used once the sample was removed from the lagoon in order to remove the water and fine materials, leaving the benthic material and coarser debris. This mesh size, however, was found to be too large and allowed many of the benthic materials to pass through. As a result, finer mesh landscape fabric was used in place of the sieve.

3.4.4 Invertebrate Sample Collection

Delays in the start of field sampling activities, combined with unusually hot and dry conditions in the TEAD area, resulted in a lack of sufficient quantities of grasshoppers for sample collection in the fall of 1994. As a result, the sampling of grasshoppers was delayed until late in the summer of 1995. This delay, however, does not impact the quality of the resulting data.

The lack of abundant grasshopper samples for collection necessitated the collection of various species of ground beetles as well. Both beetles and grasshoppers were collected at all of the SWMUs in ESA-1 and ESA-2 rather than ESA-2 alone, and also at the RSA. Metal coffee cans and 1-gallon polyethylene containers—thoroughly precleaned with soap, distilled water, and isopropanol—were placed in the ground below the soil level at various locations in the SWMUs and at the RSA. The cans were baited with chicken livers placed inside a mesh screen; the beetles were subsequently removed with tweezers, placed in sample jars, and frozen in a cooler containing dry ice. Photographs were taken and descriptions of the grasshoppers and beetles were recorded along with approximate measurements. Beetles and grasshoppers were kept segregated for analysis; however, composite samples were prepared at HES in order to achieve adequate sample sizes for analysis. The composited samples were prepared by combining grasshoppers separately from beetles for each SWMU grouping (i.e., all grasshoppers for SWMUs 21/37 were combined to form several grasshopper samples; likewise, all beetles from SWMUs 21/37 were combined to form several separate beetle samples). It was also necessary to prioritize the analyses performed due to the lack of ample sample material. Metals, dioxins/furans, and pesticide analyses were deemed necessary based upon preliminary hazard quotient (HQ) results from the soil and biota data. Explosive, PAH, and herbicide analyses were not performed on any invertebrate samples, nor were matrix spike/matrix spike duplicate (MS/MSD) or duplicate analyses performed.

3.4.5 Co-located Soil Sample Collection

The SWEAP/QAPjP called for the primary sample depth for co-located soils to be 0 to 6 inches. However, a stainless-steel hand-operated auger was used for soil collection resulting in nominal sample depths of up to 1½ feet. This allowed sampling within the primary root zone of many of the plants sampled.

3.4.6 Small Mammal Trapping

Although not called out in the trapping procedure in the SWEAP, cotton balls were added to the traps so that small mammals (many of which are nocturnal) trapped during the night could fashion a nest for warmth. The SWEAP also listed leather gloves to be worn over nitrile gloves for personal protection against biting and scratching by trapped mammals. Due to a significant loss of dexterity using leather gloves, it was determined that two layers of nitrile gloves would be used. No personnel were bitten during field activities.

3.4.7 Sample and Survey Location Establishment

The proposed location and size of each of the sampling and survey areas were established during the planning phases of the SWERA, and corresponding location maps were prepared and submitted as part of the SWEAP. During the course of conducting the field investigation phase, however, several locations had to be moved or expanded to allow for the collection of specific key species of vegetation and jackrabbits. For example, the area of the RSA was expanded eastward toward Rush Lake and northward toward South Mountain to allow sufficient quantity of kochia, rabbitbrush, and sweetclover to be collected for analysis. The RSA was also expanded to the south to provide a larger hunting area for the collection of a sufficient quantity of jackrabbits. Vegetation sampling locations were also changed at SWMUs 10/11 and 37. A transect location was changed at SWMU 42, and the trapping grid location was changed at SWMUs 1b/1c and 12/15. Although the original proposed locations were general in nature, the revised locations are accurately shown on maps derived from aerial photographs, topographic maps, and facility drawings.

Locations of specific samples were established utilizing a Brunton compass and tape measure as specified in the SWEAP for small mammal trapping grids, vegetation transects, and sampling locations. However, sample locations for jackrabbits were primarily established through the use of a Global Positioning System (GPS), which provides location coordinates in latitude and longitude. This technique, although not as accurate, was the alternative method chosen due to the remoteness of many of the sample locations (large distances from established control points). Since the rabbits forage over a relatively large area, the accuracy of the sample locations using GPS was deemed to be sufficient.

The vegetation survey transects were originally to be established utilizing 100-by-100-meter grid blocks around a specific area of contamination at each SWMU within an ESA. Transect locations started within the center of a randomly (from a random number table) selected grid block with orientation based on random selection from four numbers: 1=north, 2=east, 3=south, and 4=west. This procedure was changed where grid blocks were randomly selected using a computer-generated random number. Transects were established along the grid block perimeter (rather than center) by random number selection (using a random number table) for the transect starting point with 1=northeast corner, 2=southeast corner, 3=southwest corner, and 4=northwest corner of the grid block.

The transects then extended 33 meters from a selected corner in a clockwise direction (i.e., 1=northeast corner moving south, 2=southeast corner moving west, 3=southwest corner moving north, and 4= northwest corner moving east). This allowed better control of transect locations and reduced the field survey time by using established grid lines rather than taking the additional steps of field determination of the grid midpoint, and establishment of proper orientation of the transect using a compass.

Small mammal trapping grids according to the SWEAP were to be 90 meters square for a total of 2 acres per grid. The actual grid size used was 60 meters square for a total coverage of approximately 0.9 acres.

3.4.8 Equipment Decontamination

Due primarily to health and safety concerns, decontamination of animal traps and PPE was added to the procedure following animal collection for qualitative and quantitative surveys. This decontamination consisted of washing equipment and PPE with a solution of chlorine bleach and distilled water (5 percent mixture).

4.0 ANALYTICAL PROGRAM SUMMARY

This section describes the analytical program used by Rust E&I to perform chemical analysis on the samples taken as part of the SWERA. A discussion is provided of the QA/QC procedures used to ensure that all data were valid and usable in the performance of the risk assessment calculations. The analytical results are presented in Section 5.0 of this report. Samples were taken from two distinct media: (1) co-located soil and (2) biota. The soil samples were analyzed by DataChem Laboratories, Inc. and Pace Laboratories, the biota samples by HES and TLI.

4.1 SELECTION OF ANALYTES

A review of the existing data was performed on the SWMUs identified in Section 2.2.2, COPC Screening Process. This review provided the basis for selecting COPCs at the SWMUs as stated in Section 1.4.2.1 of the SWEAP/QAPjP. The following are the general chemical classes of analytes that were chosen for analysis:

- Metals (soil and biota)
- Pesticides/PCBs (soil)
- Pesticides/herbicides (biota, not including invertebrate tissue for herbicides)
- SVOCs (soil)
- PAHs (biota, not including invertebrate tissue)
- Explosives (soil and biota not including jackrabbit or invertebrate tissue)
- Polychlorinated dibenzodioxins and polychlorinated dibenzofurans (soil and biota)

The specific COPCs are referenced in Tables 2-6 and 2-8.

4.2 ANALYTICAL METHODS

Methods used to analyze all samples were based on USAEC and/or USEPA standard methods. Tables 4-1 and 4-2 present a listing of the inorganic and organic analytical methods used for chemical analysis of the soil samples based upon the 1990 USAEC analytical program. Table 4-3 presents the analytical methods used for chemical analysis of the biota samples. Method-specific procedures were developed for biota analyses.

The following sections describe the overall approach used by Rust E&I to ensure that valid data were received from the laboratory. Performance criteria for biota methods are summarized in Tables 4-4 through 4-6.

Table 4-1. Summary of Inorganic Analytical Methods for Co-located Soil Sampling (USAEC 1990 Program)

Analyte	Analyte Code	SOIL Method Number	CRL[a] (μg/g)[b]	WATER Method Number	CRL (μg/L)[c]
Arsenic-GFAA[d]	AS	B9	2.5	AX8	2.35
Selenium-GFAA	SE	JD20	0.449	SD25	2.53
Antimony-GFAA	SB	7041	1.0[e]	7041	60[e]
Cyanide-autoanalyzer	CYN	KF15	0.25	TF34	5.0
ICP[f] Metals		JS12		SS12	
Silver	AG		0.803		10.0
Aluminum	AL		11.2		112
Arsenic	AS		16.4		117
Boron	B		6.64		230
Barium	BA		3.29		2.82
Beryllium	BE		0.427		1.12
Calcium	CA		25.3		105
Cadmium	CD		1.20		6.78
Cobalt	CO		2.50		25.0
Chromium	CR		1.04		16.8
Copper	CU		2.84		18.8
Iron	FE		6.66		77.5
Potassium	K		131		1240
Magnesium	MG		10.1		135
Manganese	MN		9.87		9.67
Molybdenum	MO		14.3		52.7
Sodium	NA		38.7		279
Nickel	NI		2.74		32.1
Lead	PB		7.44		43.4
Tin	SN		7.43		59.9
Tellurium	TE		14.9		118
Thallium	TL		34.3		125
Vanadium	V		1.41		27.6
Zinc	ZN		2.34		18.0
Mercury (CVAA)[g]	HG	Y9	0.05	CC8	0.10

[a]Certified reporting limit.
[b]Micrograms per gram.
[c]Micrograms per liter.
[d]Graphite furnace atomic absorption.
[e]USEPA SW 846 Method Detection Limit.
[f]Inductively coupled plasma.
[g]Cold vapor atomic absorption.

Table 4-2. Summary of Organic Analytical Methods for Co-located Soil Sampling (USAEC 1990 Program)

Analyte	Analyte Code	SOIL Method Number	CRL[a] (μg/g)[b]	WATER Method Number	CRL (μg/L)[c]
EXPLOSIVES (HPLC)[d]		LW23		UW25	
1,3,5-Trinitrobenzene	135TNB		0.922		0.210
1,3-Dinitrobenzene	13DNB		0.504		0.458
2,4,6-Trinitrotoluene	246TNT		2.00		0.426
2,4-Dinitrotoluene	24DNT		2.50		0.397
2,6-Dinitrotoluene	26DNT		2.00		0.600
HMX	HMX		2.00		0.533
Nitrobenzene	NB		1.14		0.682
RDX	RDX		1.28		0.416
Tetryl	TETRYL		2.11		0.631
GC/MS[e] SEMIVOLATILES		LM25		UM25	
1,2,3-Trichlorobenzene	123TCB		0.032		5.8
1,2,4-Trichlorobenzene	124TCB		0.22		2.4
1,2-Dichlorobenzene	12DCLB		0.042		1.2
1,2-Diphenylhydrazine	12DPH		0.52		13
1,3-Dichlorobenzene-d4 (Surr)	13DBD4		0.050		14
1,3-Dichlorobenzene	13DCLB		0.042		3.4
1,4-Dichlorobenzene	14DCLB		0.034		1.5
2,3,6-Trichlorophenol	236TCP		0.62		1.7
2,4,5-Trichlorophenol	245TCP		0.49		2.8
2,4,6-Tribromophenol (Surr)	246TBP		0.52		20
2,4,6-Trichlorophenol	246TCP		0.061		3.6
2,4-Dichlorophenol	24DCLP		0.065		8.4
2,4-Dimethylphenol	24DMPN		3.0		4.4
2,4-Dinitrophenol	24DNP		4.7		176
2,4-Dinitrotoluene	24DNT		1.4		5.8
2,6-Dinitroaniline	26DNA		0.57		8.8
2,6-Dinitrotoluene	26DNT		0.32		6.7
2-Chlorophenol	2CLP		0.055		2.8
2-Chlorophenol-d4 (Surr)	2CLPD4		0.35		47
2-Chloronaphthalene	2CNAP		0.24		2.6
2-Fluorobiphenyl (Surr)	2FBP		0.057		17
2-Fluorophenol (Surr)	2FP		0.15		22
2-Methylnaphthalene	2MNAP		0.032		1.3
2-Methylphenol	2MP		0.098		3.6
2-Nitrophenol	2NP		1.1		8.2
3,3'-Dichlorobenzidine	33DCBD		1.6		5.0
3,5-Dinitroaniline	35DNA		1.6		21
3-Nitroaniline	3NANIL		3.0		15
3-Nitrotoluene	3NT		0.34		2.9
4,6-Dinitro-2-Cresol	46DN2C		0.80		--
4-Bromophenyl Phenyl Ether	4BRPPE		0.041		22
4-Chloro-3-methylphenol	4CL3C		0.93		8.5
4-Chlorophenyl Phenyl Ether	4CLPPE		0.17		23
4-Methylphenol	4MP		0.24		2.8
4-Nitrophenol	4NP		3.3		96
Alpha-BHC	ABHC		1.3		5.3

Table 4-2. Summary of Organic Analytical Methods for Co-located Soil Sampling (USAEC 1990 Program) (continued)

Analyte	Analyte Code	SOIL Method Number	CRL[a] (µg/g)[b]	WATER Method Number	CRL (µg/L)[c]
GC/MS SEMIVOLATILES (continued)		LM25		UM25	
Endosulfan I	AENSLF		0.40		23
Aldrin	ALDRN		1.3		13
Acenaphthene	ANAPNE		0.041		5.8
Acenaphthalene	ANAPYL		0.033		5.1
Anthracene	ANTRC		0.71		5.2
Atrazine	ATZ		0.065		5.9
Bis (2-Chloroethoxy) Methane	B2CEXM		0.19		6.8
Bis (2-Chloroisopropyl) Ether	B2CIPE		0.44		5.0
Bis (2-Chloroethyl) Ether	B2CLEE		0.36		0.68
Bis (2-Ethyl hexyl) Phthalate	B2EHP		0.48		7.7
Benzo (a) Anthracene	BAANTR		0.041		9.8
Benzo (a) Pyrene	BAPYR		1.2		14
Benzo (b) Fluoranthene	BBFANT		0.31		10
Beta-BHC	BBHC		1.3		17
Butyl Benzyl Phthalate	BBZP		1.8		28
Endosulfan II	BENSLF		2.4		42
Benzo (ghi) Perylene	BGHIPY		0.18		15
Benzo (k) Fluoranthene	BKFANT		0.13		10
Bromacil	BRMCIL		–		2.9
Benzyl Alcohol	BZALC		0.032		4.0
Chrysene	CHRY		0.032		7.4
Hexachlorobenzene	CL6BZ		0.080		12
Hexachlorocyclopentadiene	CL6CP		0.52		54
Hexachloroethane	CL6ET		1.8		8.3
Chlordane	CLDAN		0.68		37
p-Chlorophenylmethyl Sulfide	CPMS		0.097		10
p-Chlorophenylmethyl Sulfoxide	CPMSO		0.32		15
p-Chlorophenylmethyl Sulfone	CPMSO2		0.066		5.3
Dibenzo (a,h) Anthracene	DBAHA		0.31		12
Dibromochloropropane	DBCP		0.071		12
Delta-BHC	DBHC		0.21		–
Dibenzofuran	DBZFUR		0.38		5.1
Dicyclopentadiene	DCPD		0.57		5.5
Vapona	DDVP		0.068		8.5
Diethyl Phthalate	DEP		0.24		5.9
Diethyl Phthalate-d4 (Surr)	DEPD4		0.060		8.7
Diisopropylmethylphosphonate	DIMP		–		21
Dithiane	DITH		0.065		3.3
Dieldrin	DLDRN		0.079		26
Dimethylmethylphosphonate	DMMP		–		130
Dimethyl Phthalate	DMP		0.063		2.2
Di-n-butyl Phthalate	DNBP		1.3		33
Di-n-Octyl Phthalate	DNOP		0.23		1.5
Di-n-octylphthalate-d4 (Surr)	DNOPD4		0.065		13
Endrin	ENDRN		1.3		18
Endrin Aldehyde	ENDRNA		1.8		5.0
Endosulfan Sulfate	ESFS04		1.2		50

Table 4-2. Summary of Organic Analytical Methods for Co-located Soil Sampling (USAEC 1990 Program) (continued)

Analyte	Analyte Code	SOIL Method Number	SOIL CRL[a] (µg/g)[b]	WATER Method Number	WATER CRL (µg/L)[c]
GC/MS SEMIVOLATILES (continued)		LM25		UM25	
Fluoranthene	FANT		0.032		24
Fluorene	FLRENE		0.065		9.2
Hexachlorobutadiene	HCBD		0.97		8.7
Heptachlor	HPCL		0.24		38
Heptachlor Epoxide	HPCLE		0.48		28
Indeno (1,2,3,cd) Pyrene	ICDPYR		2.4		21
Isodrin	ISODR		0.48		7.8
Isophorone	ISOPHR		0.39		2.4
Gamma-BHC (Lindane)	LIN		0.10		7.2
Methoxyclor	MEXCLR		0.26		11
Mirex	MIREX		0.14		24
Malathion	MLTHN		0.18		21
Naphthalene	NAP		0.74		0.50
Nitrobenzene	NB		1.8		3.7
Nitrobenzene-d5 (Surr)	NBD5		0.22		26
N-Nitrosodimethylamine	NNDMEA		0.46		9.7
N-Nitroso-Di-n-Propylamine	NNDNPA		1.1		6.8
N-Nitrosodiphenylamine	NNDPA		0.29		3.7
1,4-Oxathiane	OXAT		0.075		27
PCB-1016[f]	PCB016		0.32		–
PCB-1260	PCB260		0.79		–
PCB-1262	PCB262		6.3		–
Pentachlorophenol	PCP		0.76		9.1
Phenanthrene	PHANTR		0.032		9.9
Phenol-d6 (Surr)	PHEND6		0.069		34
Phenol	PHENOL		0.052		2.2
4,4'-DDD	PPDDD		0.064		18
4,4'-DDE	PPDDE		0.068		14
4,4'-DDT	PPDDT		0.10		18
Parathion	PRTHN		1.7		37
Pyrene	PYR		0.083		17
Supona	SUPONA		0.92		19
Terphenyl-d14 (Surr)	TRPD14		0.13		35
Toxaphene	TXPHEN		12.0		–
ORGANOCHLORINE PESTICIDES I		LH17		UH20	
Alpha-BHC	ABHC		0.0028		0.0025
Endosulfan I	AENSLF		0.0010		0.0025
Aldrin	ALDRN		0.0014		0.0074
Beta-BHC	BBHC		0.0077		0.0099
Endosulfan II	BENSLF		0.0007		0.0077
Chlordane	CLDAN		0.0684		0.0312
Delta-BHC	DBHC		0.0085		0.0034
Dieldrin	DLDRN		0.0016		0.0074
Endrin	ENDRN		0.0065		0.0176
Endrin Aldehyde	ENDRNA		–		0.0504

Table 4-2. Summary of Organic Analytical Methods for Co-located Soil Sampling (USAEC 1990 Program) (continued)

Analyte	Analyte Code	SOIL Method Number	CRL[a] (µg/g)[b]	WATER Method Number	CRL (µg/L)[c]
ORGANOCHLORINE PESTICIDES I (continued)		LH17		UH20	
Heptachlor	HPCL		0.0022		0.0025
Heptachlor Epoxide	HPCLE		0.0013		0.0063
Isodrin	ISODR		0.0030		0.0025
Gamma-BHC (Lindane)	LIN		0.0010		0.0025
Methoxyclor	MEXCLR		0.0359		0.0750
PCB-1016	PCB016		0.100		0.385
PCB-1221	PCB221		–		–
PCB-1232	PCB232		–		–
PCB-1242	PCB242		–		–
PCB-1248	PCB248		–		–
PCB-1254	PCB254		–		–
PCB-1260	PCB260		0.0479		0.176
p,p'-DDD	PPDDD		0.0027		0.0081
p,p'-DDE	PPDDE		0.0027		0.0039
p,p'-DDT	PPDDT		0.0035		0.0025
Toxaphene	TXPHEN		0.226		1.64
DIOXINS/FURANS		SW-846 Method 8280		SW-846 Method 8280	
2,3,7,8-Tetrachlorodibenzo-p-dioxin	2378-TCDD		–	–	
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	12378-PeCDD		–	–	
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	123478-HxCDD		–	–	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	123678-HxCDD		–	–	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	123789-HxCDD		–	–	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	1234678-HpCDD		–	–	
Octachlorodibenzodioxin	OCDD		–	–	
2,3,7 8-Tetrachlorodibenzofuran	2378-TCDF		–	–	
1,2,3,7,8-Pentachlorodibenzofuran	12378-PeCDF		–	–	
2,3,4,7,8-Pentachlorodibenzofuran	23478-PeCDF		–	–	
1,2,3,4,7,8-Hexachlorodibenzofuran	123478-HxCDF		–	–	
1,2,3,6,7,8-Hexachlorodibenzofuran	123678-HxCDF		–	–	
2,3,4,6,7,8-Hexachlorodibenzofuran	234678-HxCDF		–	–	
1,2,3,7,8,9-Hexachlorodibenzofuran	123789-HxCDF		–	–	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1234678-HpCDF		–	–	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1234789-HpCDF		–	–	
Octachlorodibenzofuran	OCDF		–	–	

Note.-"–"= No CRL available for this analyte; method is not a USAEC certified method; detection limit for each dioxin/furan analyte is calculated at the time of analysis.

[a]Certified reporting limit.

[b]Micrograms per gram.

[c]Micrograms per liter.

[d]High performance liquid chromatography.

[e]Gas chromatography/mass spectroscopy.

[f]All other non-certified PCBs are based on the relative data for PCB-1016 and PC-1260. All PCB values are calculated based upon each analysis.

Table 4-3. Summary of Analytical Methods for Biota Samples

Assay Name	Method Type	Method Number [a]
Organochlorine Pesticides (p,p'-DDT[b], p,p'-DDE[c])	GC/ECD[d]	Method 8080
Phenoxy Acid Herbicides (2,4-Dichlorophenoxyacetic acid)	GC/ECD	Method 8151
Polynuclear Aromatic Hydrocarbons (benzo(a)anthracene,benzo(k)fluoranthene, phenanthrene,chrysene,pyrene,fluoranthene)	HPLC[e]	Method 8310
Explosive Residues (2,4,6-Trinitrotoluene, RDX[f])	HPLC	Method 8330
Arsenic	GFAA[g]	Method 7060
Cadmium	GFAA	Method 7131
Lead	GFAA	Method 7421
Antimony	GFAA	Method 7041
Selenium	GFAA	Method 7740
Mercury	CVAA[h]	Method 7471
Metals	ICP[i]	Method 6010
Polychlorinated Dibenzodioxins and Dibenzofurans (including totals)	HR-GC/MS[j]	Method 8290

[a]USEPA SW-846 Method Number.
[b]p,p'-Bis(p-chlorophenyl)-1,1,1-trichloroethane.
[c]p,p'-Bis(p-chlorophenyl)-1,1-dichloroethene.
[d]Gas chromatograph with electron capture detector.
[e]High performance liquid chromatography.
[f]Cyclonite.
[g]Graphite furnace atomic absorption.
[h]Cold vapor atomic absorption.
[i]Inductively-coupled plasma spectroscopy.
[j]High resolution-gas chromatography/mass spectrometry.

Table 4-4. Summary of Biota Method Performance Criteria for Inorganic Analytes

Method No.	Method Name	Matrix	MDL[a] ($\mu g/g$, ppm)	LCS/SRM [b] Recovery Limits	Duplicate %RPD[c]	Matrix Spike Recovery	Matrix Spike Duplicate %RPD	Surrogate Recovery Limits
MP-ICPT-RUST	Metals by Inductively - coupled Plasma (ICP) Spectroscopy							
	Aluminum	JR[d]	8.66	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV[i] must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB[e]	19.3					
		SC[f]	11.3					
		GW[g]	80.5					
		GH[h]	4.94					
	Barium	JR	4.43	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	0.411					
		SC	1.45					
		GW	1.75					
		GH	0.381					
	Beryllium	JR	0.0026	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	0.0060					
		SC	0.0034					
		GW	0.0042					
		GH	0.00314					
	Chromium	JR	0.0996	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	0.060					
		SC	0.0779					
		GW	0.185					
		GH	0.0666					
	Cobalt	JR	0.0522	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	0.0945					
		SC	0.0719					
		GW	0.0766					
		GH	0.065					
	Copper	JR	0.265	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	0.683					
		SC	0.955					
		GW	1.08					
		GH	1.00					
	Iron	JR	95.3	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	18.1					
		SC	10.6					
		GW	61.6					
		GH	4.25					

Table 4-4. Summary of Biota Method Performance Criteria for Inorganic Analytes (continued)

Method No.	Method Name	Matrix	MDL[a] (μg/g, ppm)	LCS/SRM [b] Recovery Limits	Duplicate %RPD[c]	Matrix Spike Recovery	Matrix Spike Duplicate %RPD	Surrogate Recovery Limits
MP-ICPT-RUST (continued)	Lead	JR	0.098[f]	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	----					
		SC	----					
		GW	----					
		GH	----					
	Manganese	JR	0.536	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	1.36					
		SC	3.67					
		GW	3.84					
		GH	3.99					
	Nickel	JR	0.0992	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	0.215					
		SC	0.227					
		GW	0.185					
		GH	0.393					
	Silver	JR	0.371	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	0.162					
		SC	0.0704					
		GW	0.157					
		GH	0.0828					
	Vanadium	JR	0.0554	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	0.0781					
		SC	0.124					
		GW	0.107					
		GH	0.0684					
	Zinc	JR	3.92	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value and ICP serial dilution must be within 10% of original value.
		RB	1.16					
		SC	0.598					
		GW	3.19					
		GH	3.26					
MP-AST-RUST	Arsenic-GFAA[g]	JR	0.268	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value.
		RB	0.258					
		SC	0.295					
		GW	0.628					
		GH	0.189					

Table 4-4. Summary of Biota Method Performance Criteria for Inorganic Analytes (continued)

Method No.	Method Name	Matrix	MDL[a] (μg/g, ppm)	LCS/SRM [b] Recovery Limits	Duplicate %RPD[c]	Matrix Spike Recovery	Matrix Spike Duplicate %RPD	Surrogate Recovery Limits
MP-CDT-RUST	Cadmium-GFAA	JR	0.114					
		RB	0.108					
		SC	0.125	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value.
		GW	0.408					
		GH	0.100					
MP-HGTA-RUST	Mercury-CVAA[l]	JR	0.0028					
		RB	0.0070					
		SC	0.0063	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 20% of true value.
		GW	0.016					
		GH	0.0093					
MP-PBT-RUST	Lead GFAA	RB	0.281					
		SC	0.194					
		GW	0.351	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value.
		GH	0.301					
MP-SET-RUST	Selenium-GFAA	JR	0.241					
		RB	0.446					
		SC	0.609	75-125% of spike conc.	≤20%	75-125%	≤50%	CCV must be within 10% of true value.
		GW	0.563					
		GH	0.0968					
MP-SBT-RUST	Antimony-GFAA	JR	0.461					
		RB	0.523					
		SC	1.00	75-125% of spike conc.	≤20%	65-125%	≤50%	CCV must be within 10% of true value.
		GW	0.329					
		GH	0.204					

[a] Method detection limit.
[b] Laboratory control sample/standard reference material.
[c] Relative percent difference.
[d] Jackrabbit.
[e] Rabbitbrush.
[f] Sweetclover.
[g] Gumweed.
[h] Grasshopper.
[i] Continuing calibration verification.
[j] Because of Pb contamination in the RSA composite jackrabbit tissue, this value was calculated based on instrument detection limits, not from the MDL Study.
[k] Graphite furnace atomic absorption.
[l] Cold vapor atomic absorption.

Table 4-5. Summary of Biota Method Performance Criteria for Dioxin/Furan Analysis

Method Number	Method Name	Matrix	Initial Calibration % Minimum RSD[a]	Continuing Calibration Minimum % Delta Beginning	Continuing Calibration Minimum % Delta Ending	Lab Method Blank
EPA-8290	Dioxins/Furans by High Resolution Gas Chromatography-Mass Spectrometry	All	A. Unlabeled analytes 20%	A. Unlabeled analytes 20%	A. Unlabeled analytes 25%	A. Unlabeled analytes concentrations ≤1 ppt for TCDD and TCDF. ≤5 ppt for Penta-Hepta CDD and CDF ≤10 ppt for OCDD and OCDF
	*2378-TCDD, 12378-PeCDD, 123478-HxCDD, 123678-HxCDD, 123789-HxCDD, 1234678-HpCDD,OCDD, 2378-TCDF, 12378-PeCDF, 23478-PeCDF, 123478-HxCDF, 123678-HxCDF, 234678-HxCDF, 123789-HxCDF, 1234678-HpCDF, 1234789-HpCDF,OCDF		B. Internal Standards 30%	B. Internal Standards 30%	B. Internal Standards 35%	B. Internal Standard recoveries must be: • 40 - 130% for Tetra through Hexa • 25-30% for Hepta through Octa
			C. Surrogate Standards 30%	C. Surrogate Standards 30%	C. Surrogate Standards 35%	C. Detection limit for blank cannot exceed: • ≤1 ppt for TCDD and TCDF • ≤5 ppt for Penta-Hepta CDD and CDF • ≤10 ppt for OCDD & OCDF
			D. Alternate Standards 30%	D. Alternate Standards 30%	D. Alternate Standards 30%	

[a]RSD=relative standard deviation

* 2378-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
12378-PeCDD	1,2,3,7,8-Pentachlorodibenzo-p-dioxin
123478-HxCDD	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
123678-HxCDD	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
123789-HxCDD	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
1234678-HpCDD	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
OCDD	Octachlorodibenzodioxin
2378-TCDF	2,3,7 8-Tetrachlorodibenzofuran
12378-PeCDF	1,2,3,7,8-Pentachlorodibenzofuran
23478-PeCDF	2,3,4,7,8-Pentachlorodibenzofuran
123478-HxCDF	1,2,3,4,7,8-Hexachlorodibenzofuran
123678-HxCDF	1,2,3,6,7,8-Hexachlorodibenzofuran
234678-HxCDF	2,3,4,6,7,8-Hexachlorodibenzofuran
123789-HxCDF	1,2,3,7,8,9-Hexachlorodibenzofuran
1234678-HpCDF	1,2,3,4,6,7,8-Heptachlorodibenzofuran
1234789-HpCDF	1,2,3,4,7,8,9-Heptachlorodibenzofuran
OCDF	Octachlorodibenzofuran

Table 4-6. *Summary of Biota Method Performance Criteria for Organic Analytes*

Method No.	Method Name	Matrix	MDL[a] (μg/kg, ppb)	LCS/SRM[b] Recovery Limits	Duplicate %RPD[c]	Matrix Spike Recovery	Matrix Spike Duplicate %RPD	Surrogate Recovery Limits
MP-ERST-RUST (Explosives)	RDX (Cyclonite)	JR[d]	ND[e]					
		RB[f]	14,000	126-153% of spike conc.	≤20%	126-153%	≤20%	3,4-DNT[j] 115-1421%
		SC[g]	410	58-84% of spike conc.	≤20%	58-84%	≤20%	3,4-DNT 60-113%
		GW[h]	7,900	54-122% of spike conc.	≤20%	54-122%	≤20%	3,4-DNT 70-96%
		GH[i]	12.8	50-57% of spike conc.	≤20%	50-57%	≤20%	3,4-DNT 58-83%
	2,4,6-Trinitrotoluene	JR	ND					
		RB	5,700	126-137% of spike conc.	≤20%	126-137%	≤20%	3,4-DNT 115-1421%
		SC	220	61-144% of spike conc.	≤20%	61-144%	≤20%	3,4-DNT 60-113%
		GW	14,000	86-201% of spike conc.	≤20%	86-201%	≤20%	3,4-DNT 70-96%
		GH	37.6	78-95% spike conc.	≤20%	78-95%	≤20%	3,4-DNT 58-83%
MP-RUSTP-RUST (Pesticides)	4,4'-DDE[k]	JR	0.67					
		RB	33.7					
		SC	2.66	38-152% of spike conc.	≤20%	38-152%	≤20%	TMX[l] 37-127%
		GW	68.5					DCB[m] 44-130%
		GH	0.86					
	4,4'-DDT[k]	JR	10					
		RB	47.6					
		SC	6.01	47-140% of spike conc.	≤20%	47-140%	≤20%	TMX 37-127%
		GW	23.1					DCB 44-130%
		GH	0.43					
MP-RUSTH-RUST (Herbicides)	2,4-Dichlorophenoxy acetic acid	JR	1,242					
		RB	1,523					
		SC	1,329	30-120% of spike conc.	≤50%	30-120%	≤50%	DCAA[n] 20-130%
		GW	2,229					
		GH	170					
MP-PRST-RUST Polynuclear Aromatic Hydrocarbons	Phenanthrene	JR	0.37	93-122% of spike conc.	≤20%	93-122%	≤20%	p-Terphenyl 47-102%
		RB	3.7	121-476% of spike conc.	≤20%	121-476%	≤20%	p-Terphenyl 52 - 94%
		SC	1.4	10-123% of spike conc.	≤20%	10-123%	≤20%	p-Terphenyl 40 - 97%
		GW	3.4	270-418% of spike conc.	≤20%	270-418%	≤20%	p-Terphenyl 50 - 80%
		GH	3.4	32-115% of spike conc.	≤20%	32-115%	≤20%	p-Terphenyl 59 - 87%
	Chrysene	JR	0.56	36-90% of spike conc.	≤20%	36-90%	≤20%	p-Terphenyl 47-102%
		RB	0.83	29-109% of spike conc.	≤20%	29-109%	≤20%	p-Terphenyl 52-94%
		SC	0.62	42-99% of spike conc.	≤20%	42-99%	≤20%	p-Terphenyl 40-97%
		GW	0.69	49-78% of spike conc.	≤20%	49-78%	≤20%	p-Terphenyl 50-80%
		GH	1.3	42-73% of spike conc.	≤20%	42-73%	≤20%	p-Terphenyl 59-87%

Table 4-6. *Summary of Biota Method Performance Criteria for Organic Analytes (continued)*

Method No.	Method Name	Matrix	MDL[a] (μg/kg, ppb)	LCS/SRM[b] Recovery Limits	Duplicate %RPD[c]	Matrix Spike Recovery	Matrix Spike Duplicate %RPD	Surrogate Recovery Limits
MP-PRST-RUST (PAHs)[p] (continued)	Fluoranthene	JR	0.86	53-94% of spike conc.	≤20%	53-94%	≤20%	p-Terphenyl 47-102%
		RB	1.3	40-98% of spike conc.	≤20%	40-98%	≤20%	p-Terphenyl 52-94%
		SC	0.60	51-81% of spike conc.	≤20%	51-81%	≤20%	p-Terphenyl 40-97%
		GW	3.6	56-130% of spike conc.	≤20%	56-130%	≤20%	p-Terphenyl 50-80%
		GH	2.9	49-84% of spike conc.	≤20%	49-84%	≤20%	p-Terphenyl 59-87%
	Pyrene	JR	0.39	58-95% of spike conc.	≤20%	58-95%	≤20%	p-Terphenyl 47-102%
		RB	0.31	45-76% of spike conc.	≤20%	45-76%	≤20%	p-Terphenyl 52-94%
		SC	0.22	42-62% of apike conc.	≤20%	42-62%	≤20%	p-Terphenyl 40-97%
		GW	1.8	59-137% of spike conc.	≤20%	59-137%	≤20%	p-Terphenyl 50-80%
		GH	1.2	49-78% of spike conc.	≤20%	49-78%	≤20%	p-Terphenyl 59-87%
	Benzo(a) anthracene	JR	0.49	39-86% of spike conc.	≤20%	39-86%	≤20%	p-Terphenyl 47-102%
		RB	0.36	51-87% of spike conc.	≤20%	51-87%	≤20%	p-Terphenyl 52-94%
		SC	0.50	39-87% of spike conc.	≤20%	39-87%	≤20%	p-Terphenyl 40-97%
		GW	0.80	44-79% of spike conc.	≤20%	44-79%	≤20%	p-Terphenyl 50-80%
		GH	1.2	53-80% of spike conc.	≤20%	53-80%	≤20%	p-Terphenyl 59-87%
	Benzo(k) fluoranthene	JR	0.50	41-88% of spike conc.	≤20%	41-88%	≤20%	p-Terphenyl 47-102%
		RB	0.81	23-100% of spike conc.	≤20%	23-100%	≤20%	p-Terphenyl 52-94%
		SC	0.45	41-86% of spike conc.	≤20%	41-86%	≤20%	p-Terphenyl 40-97%
		GW	0.81	42-75% of spike conc.	≤20%	42-75%	≤20%	p-Terphenyl 50-80%
		GH	1.1	50-76% of spike conc.	≤20%	50-76%	≤20%	p-Terphenyl 59-87%

[a]Method detection limit.
[b]Laboratory control sample/standard reference material.
[c]Relative percent difference.
[d]Jackrabbit.
[e]No data.
[f]Rabbitbrush.
[g]Sweetclover.
[h]Gumweed.
[i]Grasshopper.
[j]3,4-Dinitrotoluene
[k]p,p'-Bis(p-chlorophenol)-1,1-dichloroethene.
[l]Tetrachloro-m-xylene.
[m]Decachlorobiphenyl.
[n]p,p'-Bis(p-chlorophenol)-1,1,1-trichloroethane.
[o]2,4-Dichlorophenylacetic acid.
[p]Polynuclear aromatic hydrocarbons.

4.2.1 Laboratory Quality Control Programs

All subcontract laboratories had approved QA/QC programs (i.e., a QAP and comprehensive set of procedures) in place, which met all requirements of both the USAEC and Rust E&I. Rust E&I reviewed and approved each QA/QC program, and performed pre-award system audits before authorizing analysis of the abiotic and biotic samples.

4.2.2 Quality Control Batching for Co-located Soil Samples

All co-located soil analytical data including QC results are provided in Appendix D. Soil samples were analyzed on a lot basis, which is the maximum number of samples (including QC samples) that can be manually processed through the rate-limiting step of the method used during a 24-hour period. Typically, a lot will consist of a maximum of 20 samples. The following lists the number and concentrations of QC samples analyzed for every lot according to method class, per the USATHAMA QAP (PAM 11-41, Rev. 0, 1990):

- CLASS 1
  –1 Standard Matrix Method Blank
  –3 Standard Matrix Spikes (approximately 2, 10, and 10 times the CRL)

- CLASS 1A
  –1 Standard Matrix Method Blank/Spike (0 CRL non-surrogate, 10 CRL surrogate, all-natural matrix (field sample) spikes, 10 CRL surrogate)

- CLASS 1B
  –1 Standard Matrix Method Blank
  –1 Standard Matrix Spike (approximately 10 CRL)

- CLASS 2
  –1 Standard Matrix Method Blank
  –1 Standard Matrix Spike (1 CRL)

4.2.3 Standards and Surrogates for Co-located Soil Samples

Standard and surrogate compounds were identified in the certification requirements for each method. Specifications for these standards specified the degree of purity required (i.e., greater than 99.5 percent).

4.2.4 Control Charts for Co-located Soil Samples

Control analytes were specified for each approved USAEC method. From these control analytes, control limits were established. From the analysis of these control analytes, control

charts were generated. The minimum number of required "in-control" data values per lot were specified (i.e., two-thirds of the control analytes) in the USATHAMA QAP. If a system was found to be out of control, the laboratory was required to investigate the problem, document it, and implement the appropriate corrective action(s). The following charts were routinely generated by DataChem for the co-located soil sample analysis:

- Single-Day X-Bar Control Chart - High Spike Concentration
- Single-Day Range Control Chart - High Spike Concentration
- Three-Day X-Bar Control Chart - Low Spike Concentration
- Three-Day Range Control Chart - Low Spike Concentration

4.2.5 QC Samples for Biota Sample Analysis

Complete biota sample analytical results including QC data are provided in Appendix E. HES analyzed a total of 97 vegetation samples collected from ESA-1, ESA-2, and the RSA. Of these 97 samples, 96 were vegetation samples from 3 different species (rabbitbrush, sweetclover, and gumweed) and 1 was an ambrosia sample. The analyses for vegetation included selected metals, PAHs, the organochlorine pesticides (OCPs) DDE and DDT, dioxins/furans, explosives, and the herbicide 2,4-D. A total of 30 jackrabbits was obtained for chemical analysis. The analyses for the jackrabbits included selected metals, dioxins/furans, PAHs, pesticides, and 2-4,D. A total of 38 invertebrate samples (grasshopper and beetle) was analyzed. The analyte suite for the grasshoppers and beetles consisted of dioxins/furans, pesticides, and metals. Each sample or composite sample was analyzed separately.

The laboratory analyzed 5 percent laboratory duplicates, which consisted of an aliquot of one field sample. The laboratory also analyzed 5 percent matrix spikes (MS) and matrix spike duplicates (MSD), which also were aliquots of biota samples. Because of the limited amount of invertebrate sample material, no MS/MSDs or laboratory duplicate analyses were performed on those matrices.

Laboratory control samples (LCS) were also analyzed at a rate of one LCS per sample delivery group (SDG). For jackrabbit SDGs, RSA jackrabbit composite was used for the LCS matrix for selected metals, PAHs, pesticides, herbicides, and dioxins/furans. NIST standard reference material (SRM) bovine liver (No. 1577b) was used for selected metals only in jackrabbit SDGs. For vegetation SDGs, alfalfa was used for the LCS matrix for selected metals, PAHs, pesticides, herbicides, and dioxins/furans. SRM pine needles (No. 1575) were used for selected metals only in vegetation SDGs. Scientific-supply-house grasshoppers were used for selected metals, pesticides, and dioxins/furans in those SDGs containing grasshoppers and beetles.

Each LCS was spiked with the appropriate surrogates and analytes as per SW-846 protocol or the selected USEPA method. Table 4-7 provides a listing of the SDGs used for the SWERA biota samples.

Due to a limited amount of invertebrate material for analysis, it was necessary to prioritize the analyses based upon the preliminary risk assessment results obtained from the other biota samples. Table 4-8 provides a summary of the analytical data obtained from the analysis of the invertebrates.

4.2.6 Analytical Sample Holding Times and Preservation

Where applicable, all analytical holding times for soil and biota samples were within regulatory requirements. A table of the USAEC (formerly USATHAMA) soil holding times and sample preservatives is provided in Appendix D. At the time of this SWERA, no approved requirements for holding times and preservation for the biotic samples had been established. Holding times of up to a year had been previously approved for biotic samples at the Rocky Mountain Arsenal. No preservatives other than freezing were associated with the collection of the biotic samples for the SWERA.

4.3 SELECTION OF LABORATORIES

Laboratories were selected based on their qualifications to analyze certain types of matrices. DataChem Laboratories, a USAEC- and State of Utah-approved laboratory, was chosen to perform the analysis of the soil (abiotic) samples. DataChem was approved to subcontract the analysis of PCDDs/PCDFs in soil to Pace Laboratories.

The biota laboratories were chosen through a rigorous procurement process. A statement of work for the analysis of the biota samples was developed, and included as part of a request for proposal (RFP) sent out to five potential laboratories. The proposals were received and evaluated based on technical merit and lowest cost. Pre-award laboratory audits were performed, and the final selection of the biota laboratory was completed. HES was found to be the most qualified laboratory. HES did not have the capacity to perform the PCDD and PCDF in house, so they subcontracted that work to TLI. Pre-sample analysis audits of both HES and TLI were conducted prior to commencement of the MDL studies and sample analysis.

4.4 METHOD DETECTION LIMIT STUDIES

The SWEAP/QAPjP required that MDL studies be performed on all biota matrices. HES performed the MDL study as per the requirements defined by 40 CFR Part 136, Appendix B on five biota matrices. The specific matrices were (1) jackrabbit tissue, (2) rabbitbrush, (3) sweetclover, (4) gumweed, and (5) grasshopper. Each specific matrix was processed and analyzed using modified SW-846 procedures. A summary of HES/TLI MDLs for all of the biota matrices is presented in Table 4-9. The detailed biota MDL study is included as Appendix F in this report.

Table 4-7. Summary of TEAD Biota Sample Delivery Groups (SDG)

Matrix Type	No. of Samples Ecological Study Area	No. of Samples Reference Study Area	Total	Assigned SDG[a] No.
Jackrabbit	15	15	30	1 & 2
Rabbitbrush	29	15	44	3, 4, & 5
Sweetclover	16	15	31	6 & 7
Gumweed	14	7	21	8 & 9
Ambrosia	1	0	1	9
Grasshopper/ Beetle	25	13	38	10 & 11
Totals	**100**	**65**	**165**	

[a]Sample delivery group.

Table 4-8. Summary of Composite Invertebrate Samples and Corresponding Analyses

SWMU	Matrix	Pesticides	Dioxins/Furans	Metals	Comment
10/11	Beetle	2	1	2	
10/11	Grasshopper	2	3	3	
12/15	Beetle	1	0	1	No sample remained for reanalysis for dioxins.
12/15	Grasshopper	5	4	5	
1b/1c	Beetle	0	0	1	No sample remained for reanalysis for pesticides and dioxins.
1b/1c	Grasshopper	2	2	2	
21/37	Beetle	1	2	1	
21/37	Grasshopper	4	4	4	
42/45	Beetle	2	1	2	
42/45	Grasshopper	3	3	3	
RSA	Beetle	3	2	3	
RSA	Grasshopper	10	10	10	

Table 4-9. Summary of Biota Method Detection Limits (MDLs)

Chemical Class	Analyte Code	Analyte	Jackrabbit	Rabbitbrush	Sweetclover	Gumweed	Grasshopper
Pesticides							
µg/kg[a] (ppb)[b]	4,4'-DDE	4,4'-Dichlorodiphenyldichloroethene	0.67	33.7	2.66	68.5	0.86
	4,4'-DDT	4,4'-Dichlorodiphenyltrichloroethane	10	47.6	6.01	23.1	0.43
Herbicides			**Jackrabbit**	**Rabbitbrush**	**Sweetclover**	**Gumweed**	**Grasshopper**
µg/kg (ppb)	2,4-D	2,4-Dichlorophenoxyacetic acid	1,242	1,523	1,329	2,229	170
PAHs			**Jackrabbit**	**Rabbitbrush**	**Sweetclover**	**Gumweed**	**Grasshopper**
µg/kg (ppb)		Phenanthrene	0.3731	3.713	1.4048	3.4365	3.4
		Chrysene	0.5604	0.8324	0.6153	0.6872	1.3
		Fluoranthene	0.8553	1.2988	0.6029	3.5644	2.9
		Pyrene	0.3937	0.3142	0.2162	1.8458	1.2
		Benzo(a)anthracene	0.493	0.3565	0.5022	0.8042	1.2
		Benzo(k)fluoranthene	0.5034	0.8098	0.451	0.8073	1.1
Explosives			**Jackrabbit**	**Rabbitbrush**	**Sweetclover**	**Gumweed**	**Grasshopper**
µg/kg (ppb)	RDX	RDX/Cyclonite	ND[c]	14086.5	408	7930.8	12.8
	2,4,6-TNT	2,4,6-Trinitrotoluene	ND	5700.3	222.1	13575.7	37.6
Metals			**Jackrabbit**	**Rabbitbrush**	**Sweetclover**	**Gumweed**	**Grasshopper**
mg/kg[d], (ppm)[e]	Al	Aluminum	8.66	19.3	11.3	80.5	4.94
	Sb	Antimony	0.461	0.523	1	0.329	0.204
	As	Arsenic	0.268	0.258	0.295	0.628	0.189
	Ba	Barium	4.43	0.411	1.45	1.75	0.381
	Be	Beryllium	0.0026	0.006	0.0034	0.0042	0.00314
	Cd	Cadmium	0.114	0.108	0.125	0.408	0.1
	Cr	Chromium	0.0996	0.06	0.0779	0.185	0.0666
	Co	Cobalt	0.0522	0.0945	0.0719	0.0766	0.065
	Cu	Copper	0.265	0.683	0.955	1.08	1
	Fe	Iron	95.3	18.1	10.6	61.6	4.25
	Pb	Lead	by ICP	0.281	0.194	0.351	0.301
	Mn	Manganese	0.536	1.36	3.67	3.84	3.99
	Hg	Mercury	0.0028	0.007	0.0063	0.016	0.00933
	Ni	Nickel	0.0992	0.215	0.227	0.185	0.393
	Se	Selenium	0.241	0.446	0.609	0.563	0.0968
	Ag	Silver	0.371	0.162	0.0704	0.157	0.0828
	V	Vanadium	0.0554	0.0781	0.124	0.107	0.0684
	Zn	Zinc	3.92	1.16	0.598	3.19	3.26
Dioxins/Furans			**Jackrabbit**	**Rabbitbrush**	**Sweetclover**	**Gumweed**	**Grasshopper**
ng/kg[f] (ppt)[g]	2378-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.79	0.69	0.79	0.7	0.31
	12378-PeCDD	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	3.1	2	2.3	1.4	1.5
	123478-HxCDD	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	4.2	6.9	3.3	7.1	1.8
	123678-HxCDD	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	2.8	2.1	1.2	1.2	1.9
	123789-HxCDD	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	3.1	4.8	1.6	1.8	1.3
	1234678-HpCDD	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	2.3	1.5	1.7	0.4	1.4
	OCDD	Octachlorodibenzodioxin	6.3	8.4	3	3.7	2.1
	2378-TCDF	2,3,7 8-Tetrachlorodibenzofuran	0.88	0.8	0.6	0.4	0.54
	12378-PeCDF	1,2,3,7,8-Pentachlorodibenzofuran	1.7	1.6	1.7	4.6	1.1
	23478-PeCDF	2,3,4,7,8-Pentachlorodibenzofuran	3.9	3.2	3.1	24.8	1
	123478-HxCDF	1,2,3,4,7,8-Hexachlorodibenzofuran	1.5	4.2	1.3	2.1	1.6
	123678-HxCDF	1,2,3,6,7,8-Hexachlorodibenzofuran	2.7	2.2	1.3	2.5	1.4
	234678-HxCDF	2,3,4,6,7,8-Hexachlorodibenzofuran	1.8	3.1	2.4	3.9	1.9
	123789-HxCDF	1,2,3,7,8,9-Hexachlorodibenzofuran	1.9	3.1	2.2	0.7	0.94
	1234678-HpCDF	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.9	1.4	1.5	2.1	1.4
	1234789-HpCDF	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.5	7.4	3.3	2	1.9
	OCDF	Octachlorodibenzofuran	6.5	7	17.8	2.6	2.1

[a]Micrograms per kilogram.
[b]Parts per billion.
[c]Not detected.
[d]Milligrams per kilogram.
[e]Parts per million.
[f]Nanograms per kilogram.
[g]Parts per trillion.

For the purposes of this SWERA, the approved MDLs in biota served as the biota methods method quantitation limits (MQLs). For the co-located soil samples, the USAEC (formerly USATHAMA) performance-demonstrated method CRLs were used as the MQLs.

4.5 DATA QUALITY ASSESSMENT

This section presents a summary of the Rust E&I Data Quality Assessment (DQA) that was performed both internally (by Rust E&I) and externally (by EcoChem, Inc.) on the data that resulted from the analytical program previously discussed. The detailed results of the *external* DQA are presented in Appendix G and Appendix H, while tables containing RPDs for MS/MSDs, duplicates, and other QC samples are presented in Appendices D and E.

A critical component of the DQA process was the development of "yardsticks" by which the performance of the analytical methods used by the laboratories to analyze the biota and soil samples were evaluated. DataChem and Pace Laboratories analyzed the soil samples using USAEC-specified levels for precision, accuracy, and completeness. HES and TLI performed analysis of the biota samples utilizing modified SW-846 methods developed specifically for this project. All methods were approved by the USAEC Chemistry Branch prior to their use. The analytical protocols utilized by both laboratories resulted in data quality comparable to USEPA Levels IV and V, where the assignment of these levels is based on the following definitions:

- Level I — Field screening or analysis using portable instruments. Results are often not compound specific and not quantitative, but results are available in real-time.
- Level II — Field analyses using more sophisticated portable analytical instruments. In some cases, the instruments may be set up in a mobile laboratory on site. There is a wide range in the quality of data that can be generated, depending on the use of suitable calibration standards, reference materials, sample preparation equipment, and the training of the operator. Results may be real-time or require several hours.
- Level III — Analyses performed in an off-site analytical laboratory. Level III analyses may or may not use Contract Laboratory Program (CLP) procedures, but do not usually utilize the validation or documentation procedures required of CLP Level IV analysis. The laboratory may or may not be a CLP laboratory.
- Level IV — CLP Routine Analytical Services (RAS). All analyses are performed in an off-site analytical laboratory following CLP protocols. Level IV is characterized by rigorous QA/QC protocols and documentation.
- Level V — Analysis by non-standard methods. All analyses are performed in an off-site analytical laboratory, which may or may not be a CLP laboratory. Method development or method modification may be required for specific constituents.

4.5.1 PARCC Parameters

Rust E&I evaluated the quality of the collected data through the use of data quality indicators including precision, accuracy, representativeness, completeness, and comparability (commonly called the PARCC parameters). The end use of the measurement data defines the necessary PARCC parameters. Definitions for these parameters and a discussion of how Rust E&I addressed these data quality indicators for both the soil and biotic analytical results are summarized below. The evaluation of these parameters was based on Section 5.0 of the USEPA's *Guidance for Data Usability in Risk Assessment* (Part A) (USEPA 1990b). Specific data quality indicator results are included in Appendices D and E.

The overall quality of the analytical results was acceptable for the quality control samples of soil and biota. As a result, the majority of the collected data is usable in ecological risk assessment calculations.

4.5.1.1 *Precision*

Precision is a measure of the reproducibility of the analytical results under a given set of conditions (i.e., to obtain the same or similar results on replicate measurements of samples from the same population). Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value and can be reported as any one of several terms, but is typically expressed as the relative percent difference (RPD). Data quality assessment of the co-located soil and biota samples was based on the QC criteria recommended in the USAEC QA/QC Program Manual (USATHAMA PAM 11-41), *National Functional Guidelines for Organic Data Review* (USEPA 1994b), and *National Functional Guidelines for Inorganic Data Review* (USEPA 1994a).

For the QC samples under the analytical program identified in Section 4.2, precision is expressed as the RPD between the primary and duplicate pairs of samples. These pairs may be collected either in the field or prepared in the laboratory depending on the process being evaluated for precision. The precision of the sampling and sample handling process is evaluated by collecting and analyzing field duplicate samples. Laboratory duplicates, which demonstrate the precision of the analytical process (i.e., instrument and method parameters), are prepared in the laboratory after the samples are collected. The overall precision of the field and laboratory QC samples was acceptable. Additional information on QC sample precision is presented in Appendices D and E.

Field precision was not evaluated for the biota samples as extreme variability and lack of reproducibility precluded the collection of biota field duplicates. For the co-located soil samples, field duplicates were taken as part of the sample collection process and were intended to show the consistency of the sample collection and sample handling process. Field precision for the co-located soil samples was acceptable. Detailed RPD tables are presented in Appendix D.

For the biota samples (except for grasshoppers), analytical precision was evaluated by analyzing 5 percent laboratory duplicates and 5 percent MSDs (or one per SDG). The laboratory duplicates were prepared in the laboratory and consisted of homogenous aliquots of the original biota samples. These laboratory duplicates were intended to quantify how well a particular analytical method is able to reproduce results for a specific sample and medium (e.g., vegetation or jackrabbit tissue). The overall analytical precision of the biota analytes proved to be acceptable. Additional information on biota laboratory precision is presented in Appendix E.

For the soil samples, analytical precision was evaluated by calculating the RPD values between MS and MSDs of the soils collected in the field. The overall analytical precision of the soils analyses proved to be acceptable. Additional information on soils laboratory precision is presented in Appendix D.

4.5.1.2 *Accuracy*

Accuracy is a quantitative evaluation of how close a measured value lies to a known value. It is usually evaluated by spiking a known amount of an analyte or surrogate to a specific matrix and comparing the measured results to the known amount added. Accuracy is reported as a percent recovery (%R) of spiked target analytes or surrogate compounds from standard matrices of water, soil, or biota. The accuracy is a measure of the variability that may have been introduced during the preparation and/or elution of the sample and is best measured by computing the mean of many recoveries under similar conditions.

To determine accuracy, laboratory QC samples for both soils and biotic samples included MS (5 percent) and LCS (5 percent as a minimum), based on the number of samples in a batch or SDG. Analytical accuracy was evaluated by analyzing 5 percent laboratory duplicates and 5 percent MSDs except for the grasshopper matrix. The laboratory duplicates were taken after sample preparation and elution, and are presented for a comparison of %Rs for recoveries of surrogates, internal standards, and spike compounds in the MS/MSDs.

Laboratory accuracy was assessed through the use of sample spikes and QC samples. For example, a sample (or blank) may be spiked with an organic or inorganic compound of known concentration and the average %R calculated as a measurement of accuracy. Field QC samples—such as field blanks and duplicates, and equipment rinse blanks—were taken for the soil samples. Appendix D presents the QC results for these samples. No field QC samples were taken in association with the biota sampling.

With soil samples, the standard matrix spikes %Rs were good to excellent, while natural matrix spikes %Rs showed more variability (probably because of matrix interferences). Additional information on soil sample accuracy is presented in Appendix D.
With the biota samples, accuracy was measured by using surrogate compounds for overall analyses, and matrix spike samples and laboratory control samples for all analyses. The overall accuracy of the biota analyses was acceptable. Additional information on biota sample accuracy is presented in Appendix E.

4.5.1.3 *Representativeness*

Representativeness is a measure of how closely measured results reflect the actual concentration or distribution of chemical compounds in a sampled media. Representativeness is a qualitative parameter that is most concerned with proper design of the sampling program. Field sampling design, including the number, location, and frequency of samples; sampling and subsampling techniques; and sample custody and shipment were used to provide data that are representative of the concentrations of contaminants in the natural media that were sampled.

With the soil samples, the number of field samples collected for the QC requirements is consistent with USEPA guidance for the numbers and frequency of QC samples. The requirements for sample collection and subsampling, sample handling, sample preparation, and sample analysis in the approved SWEAP/QAPjP were also met. From the results of the QC samples, the data are representative of contaminant concentrations in the sampled media in the ESAs and the RSA. Those few analyses that failed to meet QC criteria and were rejected, were not used in the risk assessment, and other sample analyses representative of the areas under study were available for the risk assessment.

Similarly, biota samples met QC requirements of the approved SWEAP/QAPjP and were considered representative of the target populations of jackrabbit, rabbitbrush, sweetclover, gumweed, beetles, and grasshoppers. Because of insufficient sample material, all dioxin/furan analyses of two samples (EL5-95-01C and EG7-95-02C) were rejected without repeat analysis. One pesticide sample was lost in the laboratory process. As noted in Section 4.5.2.3.1, analyses of certain dioxins in two other samples were rejected as a result of failing QC criteria and were not used for risk assessment purposes. In all cases, additional analyses from other samples taken in the same study areas were available for the risk assessment

4.5.1.4 *Completeness*

Completeness is defined as the percentage of measurements that are judged to be valid. The completeness goal is essentially the same for all data uses: a sufficient amount of data must be obtained to make the necessary decision or take the necessary action.

For this project, two types of samples were identified for each activity: (1) population samples and (2) unique, critical samples. Population samples are those samples that are collected with the intent to characterize the overall nature and extent of contamination within a population. They are often grouped or averaged; no one sample is more important than another. The completeness goal for these samples can be less than 100 percent as long as sufficient data are available to perform the characterization of site conditions. The majority of the SWERA samples were considered to be population samples. Unique, critical samples are individual samples that are unique to a specific media, location, or time, and on whose results specific decisions are made. If the decision cannot be made without this datum, the completeness goal must be 100 percent. Where a single biota sample was available to represent a study area

(SWMU or RSA), all analyses from that sample were considered unique and critical. The following were the SWERA completeness goals, and the results for each sampling activity that were identified in the SWEAP/QAPjP:

- For COPCs where more than one datum exists for a particular analyte in a specific sample and matrix, 90 percent of sample results for each analyte must be usable.

- For other analytes, 75 percent of each method's analytes must have usable results for at least 75 percent of the samples.

The above goals were achieved during the SWERA sampling and analysis program. The great majority of the data collected during the program were considered to be usable in the quantitative risk assessment, and other than some analyses originally planned for invertebrate tissue, the data types were complete. Insufficient invertebrate sample material precluded some other optional analyses; however, those analyses were not considered critical for the SWERA.

The sample data for soils were evaluated, and the majority were found to be usable. Flag codes and/or data qualifiers were listed for some of the field samples and laboratory spiked matrix and matrix duplicate samples. Three metal analyses and four SVOC analyses were rejected and were not used in the risk assessment. The soil sample and QC data were considered complete for risk assessment purposes.

With the biota data, some sample analyses were initially rejected because of QC problems and, in most cases, re-analyzed and used in the quantitative risk assessment. As noted above, and in Section 4.5.2.3.1, rejected dioxin/furan analyses from one beetle sample and one grasshopper sample were not reanalyzed because of the lack of sample material and were not included in the risk assessment. Pesticides were not reported in one beetle sample due to a lack of sample material available for reanalysis. No data with "R" qualifiers were included in the risk assessment. After evaluation of the data qualifiers and analytical laboratory responses, the biota data were considered complete.

4.5.1.5 *Comparability*

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Comparability was maintained by use of consistent sampling procedures, USAEC-performance-demonstrated and USEPA-approved or standardized analytical methods, consistent detection limits, and consistent units of measurement.

Soil QC samples were collected and analyzed using the same sampling procedures and analytical methods, including instrument detection limits and units of measurement. The QC data set was comparable to the soil data set that was collected for the SWERA.

The higher detection limits associated with the dioxins/furans in soil analytical method SW-846 8280 somewhat limited the comparability of the soil data set to the biota analytical data set. Method 8290, which was used for the biota, achieved detection limits in the parts-per-trillion

range, as compared to the parts per million/parts per billion range for Method 8280. This resulted in a lower model fit for the dioxins/furans as presented in Section 7.2.2.4.

The biota samples were analyzed using modified methods since no standard methods existed for these matrices. These methods were developed from USEPA-approved standard methods and modified according to the nature of the matrix. All methods were thoroughly documented. MDL studies were done in order to determine the detection limits of the methods used, which were comparable to detection limits for other difficult matrices analyzed using standard methods. Sufficient QC samples, including matrix spikes, surrogates, duplicates, and laboratory control samples, were analyzed to ensure that other laboratories could produce equivalent results from the same samples using the same methods.

4.5.2 Data Validation

Rust E&I conducted a comprehensive data validation on the data from the sampling and analysis program associated with the SWERA. This section presents a summary discussion of the data validation. Detailed data validation results are provided in Appendices G and H.

4.5.2.1 *Laboratory Data Reduction*

Data reduction performed by DataChem and Pace Laboratories, either manually or by computer, was completely documented, including the equations used to calculate the concentration or value of the measured parameter and reporting units. The analytical methods provided the equations used. Documentation of the data reduction process was included in all of the data packages. Calculations were checked and that review documented.

Data reduction for biota data was performed by HES and TLI. Whether performed manually or by computer, the process was documented and included (with a few exceptions) the equations used to calculate the concentration or value of the parameter of interest and its reporting units. In a few cases, the exact regression parameters were not specified, and the data validators could not reproduce the values to more than a few significant figures. Documentation of the data reduction process was included in all of the data packages. Calculations were checked, and the review was documented.

4.5.2.2 *Laboratory Data Verification*

All data generated by DataChem, Pace, HES, and TLI were verified, and that verification was documented prior to release of the data to Rust E&I and the USAEC Chemistry Branch. The laboratories performed data verification in accordance with their internal procedures. As part of the verification process, the laboratories performed three levels of review: (1) analyst level, (2) section level, and (3) final QC review by the project QA Coordinator. All documentation

that served as part of the data package—including laboratory notebook pages, chain-of-custody seals and forms (CoCs), non-conformance reports (NCRs), control charts, data sheets, and hardcopy gas chromatography/mass spectroscopy (GC/MS) output—were reviewed for completeness, accuracy, and legibility. As part of the verification process, the original hardcopy source documents were compared to computer print-outs to ensure that transcription errors did not occur during data entry (all data entries were checked in accordance with internal laboratory procedures or protocols).

When assembling the data packages for shipment to Rust E&I, a contents and approval checklist was included that identifies all materials placed in the data package, as well as names of reviewers, dates of review, and space for any comments, notes, or corrective actions. Also included was a discussion and explanation of any observed matrix effects, blank results, control problems, deviations from standard operating procedures (SOPs), NCRs, or digressions from normal practices (i.e., manual integrations). The impact on the usability of the data was also discussed (with explanations of the applicable flagging codes or qualifiers applied).

4.5.2.3 *Independent Data Validation*

Both DataChem and Rust E&I were required to successfully execute the PC Data Entry and Validation Subsystem on each soil transfer file before it was transmitted to Potomac Research Institute (PRI) for Level 3 verification. The Rust E&I Data Manager performed the group and record check before uploading the transfer file to the PRI electronic bulletin board for processing into the IRDMIS Database Subsystem.

Rust E&I contracted EcoChem, Inc. for an independent data validation (DV) of the soil data. This DV was based on the *National Functional Guidelines for Organic Data Review* (USEPA 1994b) and the *National Functional Guidelines for Inorganic Data Review* (USEPA 1994a). The DV was performed on 27 percent of the soil data packages. Half of the data packages were chosen randomly, and the other half consisted of data packages for which initial data quality screening indicated that potential quality problems might exist. This evaluation included the examination of raw field and laboratory data, as well as the field and laboratory QC results. The DV also evaluated the results of the laboratory's initial calibration and checked for transcription errors. This DV process evaluated the technical and evidentiary data quality, with respect to the DQOs specified for precision, accuracy, and completeness. It also evaluated the ultimate usability of the data. Additional flags were applied to data points that may have had limited usability or that were rejected. Table 4-10 provides a summary of the results of the independent data validation for the soil samples.

The biota data were also validated by EcoChem, Inc., which followed the *National Functional Guidelines for Organic Data Review* (USEPA 1994b) and the *National Functional Guidelines for Inorganic Data Review* (USEPA 1994a) in reviewing 100 percent of the biota results and quality control data as well as the documentation contained in the data packages. In addition, their assessment was based on the QC criteria in the method descriptions and the SWEAP/QAPjP.

Table 4-10. Soil Sample Independent Data Validation Results

Location	Analyte	Lot Number	Qualifiers/Comments
Reference Study Area ESB-94-06, -06D, -07	Cyanide Dioxins/Furans	APRS AQHT	None J[a]/UJ[b]-not detected or estimated; low 13C-OCDD[c] recovery
Equipment Rinses	ICP[d] Metals Dioxins/Furans	APKC APZW	None None
SWMU[e] 1B	PCBs[f]/Pesticides Explosives Mercury	APGF APGK APFJ	None None None
SWMU 1C	PCBs/Pesticides Explosives Mercury	APJY APGK APFJ	None None None
SWMU 10	Explosives	APIL	None
SWMU 11	Explosives	APIL	None
SWMU 12	Explosives	APIL	None
SWMU 15	Explosives	APIL	None
SWMU 21	Selenium Mercury	APEF APFJ	None None
SWMU 37	Selenium Mercury	APEF APFJ	None None
SWMU 42	PCBs/Pesticides Arsenic	APNK APOW	None None
SWMU 45	PCBs/Pesticides Explosives	APGF APGK	None None
SWMU 10/ES5-94-02 ES5-94-02	ICP Metals SVOCs	APJY APJM	UJ-Ag Low % Recovery R[g]-DNOP[h], MIREX, PCB016[i], PCB260[j], PCB262[k], TOXAPHENE- results rejected -not analyzed for. UJ-33DCBD[l], 4NP[m], 46DN2C[n], DBHC[o]; not detected/estimated.
SWMU 11/ES6-94-01	ICP Metals	APJY	UJ-Ag Low % Recovery J - Cr Low % Recovery J - Ni Low % Recovery
SWMU 12/ES7-94-01	ICP Metals	APJY	UJ - Ag Low % Recovery J - Mn and Pb High % Recovery
SWMU 15/ES8-94-03 ES8-94-01, ES8-94-03	ICP Metals SVOCs	APJY APJM	UJ - Ag; J-Cu; J-Pb, R-Zn R-DNOP, MIREX, PCB016, PCB260, PCB262, TOXAPHENE- results rejected - not analyzed for. UJ-33DCBD, 4NP, 46DN2C, DBHC; not detected/estimated.
SWMU 21/ES9-94-01 Duplicate for Ba and Cr ES9-94-01 DUP	ICP Metals GFAA-Selenium	APED APEF	R - MS/MSDs[p] % RPD Not in range UJ-MS/MSD low % Recovery

Table 4-10. Soil Sample Independent Data Validation Results (continued)

Location	Analyte	Lot Number	Qualifiers/Comments
SWMU 37/ ESA-94-01 Dup	ICP Metals	APED	R-Ba - % Recovery too low
ESA-94-01 Dup			R-Cr - % Recovery too low
ESA-94-02	GFAA-Selenium	APEF	UJ-MS/MSD low % Recovery
SWMU 42/ES1-94-02, ES1-94-03, and ES1-94-06	Dioxins/Furans	AQAW	U- Analyzed for but not detected. Field blank contained 2,3,7,8-TCDD

Note.—DV performed by an independent third party (EcoChem, Inc.), as per modified USAEC PAM 11-41 and USEPA data validation procedures. Data qualifiers based on independent third party review.

[a]Analyte present; reported value is an estimate.
[b]The material was analyzed for but not detected.
[c]OCDD - Octachlorodibenzodioxin, carbon-13 labeled internal standard.
[d]Inductively-coupled plasma.
[e]Solid Waste Management Unit.
[f]Polychlorinated biphenyls.
[g]Data rejected, not usable.
[h]Di-n-octyl phthalate.
[i] PCB1016.
[j] PCB1260.
[k] PCB1262.
[l]3,3'-Dichlorobenzidine.
[m]4-Nitrophenol
[n] 4,6-Dinitro-2-methylphenol.
[o]Delta-benzenehexachloride.
[p]Matrix spike/matrix spike duplicate.

In addition, Rust E&I performed its own data quality review of the biota DV by EcoChem Inc., and the associated data validation worksheets and backup information. This additional review was also based on the *National Functional Guidelines for Organic Data Review* (USEPA 1994b) and the *National Functional Guidelines for Inorganic Data Review* (USEPA 1994a). The review consisted of verification of both sets of EcoChem DQA summary reports, as well as consistency and accuracy checks on the data values and qualifiers, and the electronically formatted data. This review included all biota results for all analyte groups and included reviews of all qualified data, duplicate data, and MS/MSD data.

4.5.2.3.1 ***Independent Data Validation Results.*** The following paragraphs present a summary of EcoChem's independent data validation, or Data Quality Assessment (DQA), for each of the ESA SWMUs along with the RSA. As noted above, the DQA was based on the method-specific quality control criteria, applicable work plans, USEPA guidance documents, and USAEC quality assurance procedures. The complete DQA for the soil data is presented in Appendix G, while the biota data DQA is presented in Appendix H.

Due to the large number of qualifiers associated with the biota data, those qualifiers are provided in detailed tables with each DQA report in Appendix H. Summary level tables 4-15 and 4-16 for soil and biota are located in Section 4.5.4. These tables are provided for a review of overall analytical data quality, and the implications of data usability and data trends in the risk assessment.

The primary goal of the DQA was to assign data qualifiers where necessary to ensure proper data interpretation. Data that were assigned a "U", "J", or "UJ" qualifier are usable for site evaluation and risk assessment with the understanding that the reasons for these qualifiers were taken into consideration when interpreting the data. Data that were assigned an "R" qualifier were rejected and were not used for any site evaluation purposes.

<u>SWMU 10</u>

Soils Summary. The soil samples collected at SWMU 10 that were selected for the DQA were analyzed for the following parameters:

- ICP metals, using method JS12
- SVOCs, using method LM25
- Explosives, using method LW23

One lot of ICP metals analyses was reviewed. Silver was qualified with a "UJ" as a result of low MS/MSD recoveries in one sample. All metals data were acceptable for use, and all data requirements were met.

One lot of SVOCs analyses was reviewed. Several unknowns were qualified because of blank contamination. The CRL for four target compounds (all non-detects) were qualified as estimated in all samples in that lot because of decreased sensitivity during continuing

calibration. Three PCB aroclors (1016, 1260, and 1262) and toxaphene were reported as less than the CRL. Because these compounds were not analyzed for in the samples, the results were qualified as rejected. All other SVOC data were acceptable for use, and all data requirements were met.

One lot of explosives analyses was reviewed. No qualifiers were assigned to the explosives data. All data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 10 consisted of rabbitbrush, gumweed, grasshoppers, and beetles.

The rabbitbrush samples collected at SWMU 10 that were selected for the DQA comprised sample delivery group (SDG) RUST04 and were analyzed for the following parameters:

- Selected PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST04 Results

No qualifiers were assigned to the PAH, pesticide, or herbicide data.

Several dioxins and furans were qualified with a "UJ" in one sample because of low internal standard recoveries, while total HpCDF was qualified with a "J" in one sample because of continuing calibration problems.

The explosive RDX was qualified with a "J" in two samples as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in the same samples with a "J" or a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data.

For the metals, beryllium (two samples) was qualified with a "U" as a result of blank contamination, while lead and mercury results were qualified with a "J" as a result of low MS/MSD recoveries and high duplicate sample relative percent differences (RPD), respectively. Arsenic, cadmium, and selenium were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits.

All SWMU 10 RUST04 rabbitbrush data were acceptable for use, and all data requirements were met with the exception of some of the explosives, where data accuracy was determined to be outside of control limits.

The gumweed samples collected at SWMU 10 that were selected for the DQA comprised SDG RUST08 and were analyzed for the following parameters:

- Selected PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

<u>Sample Delivery Group RUST08 Results</u>

No qualifiers were assigned to the PAH, pesticide, dioxin/furan, or herbicide data.

The explosive 2,4,6-TNT was qualified with a "UJ" in two samples as a result of low laboratory control sample recoveries. RDX was qualified with an "R" in sample EM5-94-02 because of calibration range exceedances. The sample was then diluted and reanalyzed. The results from the reanalysis were not qualified and were subsequently used as the EM5-94-02 RDX value.

For the metals, beryllium (two samples) and antimony (one sample) were qualified with a "U" as a result of blank contamination, while silver was qualified with a "UJ" in two samples because of MS/MSD analyses being outside of control limits. The cadmium and selenium results for EM5-94-01 and EM5-94-02 were qualified with a "UJ" because of the analytical spike recovery values being outside of the control limits or high duplicate sample relative percent differences (RPDs).

All SWMU 10 RUST08 gumweed data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 10 that were selected for the DQA comprised SDG RUST10 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 10 samples were composited with samples from SWMU 11 in SDG RUST10.

Sample Delivery Group RUST10 Grasshopper Results

No qualifiers were assigned to the pesticide data.

The furan 2,3,4,6,7,8-HxCDF was qualified with a "U" in sample EG5-95-01C because of blank contamination.

For the metals, arsenic and selenium were qualified with a "J" or a "UJ" in three samples because of the analytical spike recovery values being outside of the control limits.

All SWMU 10 RUST10 grasshopper data were acceptable for use and all data requirements were met.

Sample Delivery Group RUST10 Beetle Results

The pesticides 4,4'-DDE and 4,4'-DDT were qualified with a "J" or a "UJ" in two samples because of poor agreement between the primary and confirmation column results. One of these two samples (EL5-95-01C) was also qualified with a "J" for the same two analytes because of high laboratory control sample recoveries.

The compounds OCDD and OCDF were qualified with a "J" in sample EL5-95-02C because of high internal standard recoveries.

For the metals, cadmium and selenium in sample EL5-95-01C and selenium in sample EL5-95-02C were qualified with a "J" because of the analytical spike recovery values being outside of the control limits.

All SWMU 10 RUST10 beetle data were acceptable for use, and all data requirements were met.

SWMU 11

Soils Summary. The soil samples collected at SWMU 11 that were selected for the DQA were analyzed for the following parameters:

- ICP metals, using method JS12
- Explosives, using method LW23

One lot of ICP metals analyses was reviewed. Silver, chromium, and nickel were qualified with a "J" or a "UJ" as a result of low MS/MSD recoveries in one sample. All metals data were acceptable for use, and all data requirements were met.

One lot of explosives analyses was reviewed. No qualifiers were assigned to the explosives data. All data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 11 consisted of rabbitbrush, gumweed, grasshoppers, and beetles.

The rabbitbrush samples collected at SWMU 11 that were selected for the DQA comprised SDG RUST04 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST04 Results

The PAH pyrene was qualified with a "U" in sample EB6-94-01 as a result of a detection in the associated method blank.

The pesticide 4,4'-DDE was qualified with a "J" in sample EB6-94-01 because of high percent differences between the primary and secondary column results.

Several dioxins and furans were qualified with a "U" or a "UJ" in sample EB6-94-01 because of low internal standard recoveries, while total HpCDF was qualified with a "J" in the same sample because of continuing calibration problems.

The explosive RDX was qualified with a "UJ" in sample EB6-94-01 as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in the same sample with a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data.

No qualifiers were assigned to the herbicide data.

For the metals sample EB6-94-01, beryllium was qualified with a "U" as a result of blank contamination, while lead and mercury results were qualified with a "J" as a result of low MS/MSD recoveries and high duplicate sample RPDs, respectively. Arsenic and cadmium were qualified with a "J" and a "UJ", respectively, because of the analytical spike recovery values being outside of the control limits.

All SWMU 11 RUST04 rabbitbrush data were acceptable for use and all data requirements were met, with the exception of some of the explosives, where data accuracy was determined to be outside of control limits.

The gumweed samples collected at SWMU 11 that were selected for the DQA comprised SDG RUST08 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

<u>Sample Delivery Group RUST08 Results</u>

No qualifiers were assigned to the pesticide, dioxin/furan, or herbicide data.

The PAH phenanthrene was qualified with a "J" in sample EM6-94-01 because of high surrogate percent recoveries.

The explosive 2,4,6-TNT was qualified with a "UJ" in sample EM6-94-01 as a result of low laboratory control sample recoveries.

For the metals, beryllium was qualified with a "U" in sample EM6-94-01 as a result of blank contamination, while silver was qualified with a "UJ" in the same sample because of MS/MSD analyses being outside of control limits. Arsenic, cadmium, and selenium were qualified with a "UJ" in sample EM6-94-01 because of the analytical spike recovery values being outside of the control limits or high duplicate sample RPDs.

All SWMU 11 RUST08 gumweed data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 11 that were selected for the DQA comprised SDG RUST10 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 11 samples were composited with samples from SWMU 10 in SDG RUST10.

Sample Delivery Group RUST10 Grasshopper Results

No qualifiers were assigned to the pesticide data.

The furan 2,3,4,6,7,8-HxCDF was qualified with a "U" in sample EG5-95-01C because of blank contamination.

For the metals, arsenic and selenium were qualified with a "J" or a "UJ" in three samples because of the analytical spike recovery values being outside of the control limits.

All SWMU 11 RUST10 grasshopper data were acceptable for use, and all data requirements were met.

Sample Delivery Group RUST10 Beetle Results

The pesticides 4,4'-DDE and 4,4'-DDT were qualified with a "J" or a "UJ" in two samples because of poor agreement between the primary and confirmation column results. One of these two samples (EL5-95-01C) was also qualified with a "J" for the same two analytes because of high laboratory control sample recoveries.

The compounds OCDD and OCDF were qualified with a "J" in sample EL5-95-02C because of high internal standard recoveries.

For the metals, cadmium and selenium in sample EL5-95-01C and selenium in sample EL5-95-02C were qualified with a "J" because of the analytical spike recovery values being outside of the control limits.

All SWMU 11 RUST10 beetle data were acceptable for use, and all data requirements were met.

SWMU 12

Soils Summary. The soil samples collected at SWMU 12 that were selected for the DQA were analyzed for the following parameters:

- ICP metals, using method JS12
- Explosives, using method LW23

One lot of ICP metals analyses was reviewed. Silver, manganese, and lead were qualified with a "J" or a "UJ" as a result of MS/MSD recoveries falling outside the control limits in one sample. All metals data were acceptable for use, and all data requirements were met.

One lot of explosives analyses was reviewed. No qualifiers were assigned to the explosives data. All data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 12 consisted of rabbitbrush, sweetclover, grasshoppers, and beetles.

The rabbitbrush samples collected at SWMU 12 that were selected for the DQA comprised SDG RUST04 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST04 Results

No qualifiers were assigned to the pesticide or herbicide data.

The PAHs phenanthrene and pyrene were qualified with a "J" in sample EB7-94-01 as a result of continuing calibration problems.

The analytes OCDD and OCDF were qualified with a "J" and a "UJ", respectively, in sample EB7-94-01 because of low internal standard recoveries.

The explosive RDX was qualified with a "UJ" in sample EB7-94-01 as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in the same sample with a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data.

For the metals sample EB7-94-01, beryllium was qualified with a "U" as a result of blank contamination, while lead ("J") and mercury ("UJ") results were qualified as a result of low MS/MSD recoveries and high duplicate sample RPDs, respectively. Cadmium was qualified with a "J" because of the analytical spike recovery values being outside of the control limits.

All SWMU 12 RUST04 rabbitbrush data were acceptable for use, and all data requirements were met, with the exception of some of the explosives, where data accuracy was determined to be outside of control limits.

The sweetclover samples collected at SWMU 12 that were selected for the DQA comprised SDG RUST06 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

<u>Sample Delivery Group RUST06 Results</u>

No qualifiers were assigned to the PAH, pesticide, explosive, or herbicide data.

The furan 2,3,7,8-TCDF was qualified with a "U" in sample EC7-94-01 because of detections in the associated method blank.

For the metals, beryllium (sample EC7-94-01) was qualified with a "U" as a result of blank contamination, while silver was qualified with a "UJ" in the same sample because of MS/MSD analyses being outside of control limits. The EC7-94-01 cadmium result was qualified with a "UJ" because of the analytical spike recovery values being outside of the control limits.

All SWMU 12 RUST06 sweetclover data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 12 that were selected for the DQA comprised SDG RUST10 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 12 samples were composited with samples from SWMU 15 in SDG RUST10.

<u>Sample Delivery Group RUST10 Grasshopper Results</u>

No qualifiers were assigned to the pesticide data.

Several dioxins and furans were qualified with a "UJ" in sample EG7-95-01C because of low internal standard recoveries. These low recoveries also resulted in qualifying the following

compounds with an "R" for sample EG7-95-01C: 2,3,7,8-TCDD; 1,2,3,7,8-PeCDD; 2,3,7,8-TCDF; 1,2,3,7,8-PeCDF; and the accompanying totals. (There was insufficient sample material remaining for reanalysis.) The compounds OCDD and OCDF were qualified with a "J" or a "UJ" in three samples because of internal standard recoveries being outside of the control limits.

For the metals, arsenic and selenium were qualified with a "J" or a "UJ" in five samples, while lead was qualified with a "J" in sample EG7-95-05C because of the analytical spike recovery values being outside of the control limits.

All SWMU 12 RUST10 grasshopper data were acceptable for use, and all data requirements were met with the exception of the rejected dioxins and furans noted above.

Sample Delivery Group RUST10 Beetle Results

No qualifiers were assigned to the dioxin/furan data.

The pesticide 4,4'-DDT was qualified with a "J" in sample EL7-95-01C because of poor agreement between the primary and confirmation column results and because of high laboratory control sample recoveries.

For the metals, antimony was qualified with a "U" in sample EL7-95-01C because of blank contamination while selenium was qualified with a "J" in the same sample because of the analytical spike recovery values being outside of the control limits.

All SWMU 12 RUST10 beetle data were acceptable for use, and all data requirements were met.

SWMU 15

Soils Summary. The soil samples collected at SWMU 15 that were selected for the DQA were analyzed for the following parameters:

- ICP metals, using method JS12
- SVOCs, using method LM25
- Explosives, using method LW23

One lot of ICP metals analyses was reviewed. Silver, copper, and lead were qualified with a "J" or a "UJ" as a result of MS/MSD recoveries falling outside the control limits in one sample. Zinc was qualified as rejected in one sample because of low MSD recovery values. With the exception of the rejected data, all metals data were acceptable for use, and all data requirements were met.

One lot of SVOCs analyses was reviewed. Several unknowns were qualified because of blank contamination. The CRLs for four target compounds (all non-detects) were qualified as

estimated in all samples because of decreased sensitivity during continuing calibration. Three PCB aroclors (1016, 1260, and 1262) and toxaphene were reported as less than the CRL. Because these were not target compounds under the 1990 USATHAMA protocols that were followed for this report, the results were qualified as rejected. All other SVOC data were acceptable for use, and all data requirements were met.

One lot of explosives analyses was reviewed. No qualifiers were assigned to the explosives data. All data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 15 consisted of rabbitbrush, sweetclover, gumweed, grasshoppers, and beetles.

The rabbitbrush samples collected at SWMU 15 that were selected for the DQA comprised SDG RUST04 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST04 Results

Several PAHs were qualified with a "J" in three samples as a result of continuing calibration problems.

The pesticide 4,4'-DDE was qualified with a "J" in two samples because of high percent differences between the primary and secondary column results.

Several dioxins and furans were qualified with a "J" or a "UJ" in three samples because of low internal standard recoveries, while total HpCDF was qualified with a "J" in two of the same three samples because of continuing calibration problems.

The explosive RDX was qualified with a "UJ" in three samples as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in the same samples with a "J" or a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data.

No qualifiers were assigned to the herbicide data.

For the metals, beryllium was qualified with a "U" in three samples as a result of blank contamination, while lead ("J") and mercury ("UJ") results were qualified in the same three samples as a result of low MS/MSD recoveries and high duplicate sample RPDs, respectively. Arsenic, cadmium, and selenium were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits.

All SWMU 15 RUST04 rabbitbrush data were acceptable for use, and all data requirements were met, with the exception of some of the explosives, where data accuracy was determined to be outside of control limits.

The sweetclover samples collected at SWMU 15 that were selected for the DQA comprised SDG RUST06 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST06 Results

No qualifiers were assigned to the PAH, pesticide, or herbicide data.

The furan 1,2,3,4,6,7,8-HpCDF in sample EC8-94-02 was qualified with a "U" because of detections in the associated method blank.

RDX and 2,4,6-TNT were qualified in sample EC8-94-02 with a "UJ" because of low surrogate percent recoveries.

For the metals, beryllium (two samples) was qualified with a "U" as a result of blank contamination, while silver and cadmium were qualified with a "J" or a "UJ" in the same two samples because of MS/MSD analyses being outside of control limits. The EC8-94-01 cadmium result was qualified with a "J" because of the analytical spike recovery values being outside of the control limits.

All SWMU 15 RUST06 sweetclover data were acceptable for use, and all data requirements were met.

The gumweed samples collected at SWMU 15 that were selected for the DQA comprised SDG RUST08 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST08 Results

No qualifiers were assigned to the pesticide or herbicide data.

Four PAHs were qualified with a "J" in sample EM8-94-03 because of high surrogate percent recoveries.

The furans 2,3,7,8-TCDF and 2,3,4,6,7,8-HxCDF were qualified with a "U" in sample EM8-94-03 because of blank contamination.

The explosive 2,4,6-TNT was qualified with a "UJ" in sample EM8-94-03 as a result of low laboratory control sample recoveries.

For the metals, beryllium and antimony were qualified with a "U" in sample EM8-94-03 as a result of blank contamination, while silver and cadmium were qualified with a "UJ" and a "J", respectively, because of MS/MSD analyses being outside of control limits. Cadmium was also qualified with a "J", along with selenium ("UJ") in sample EM8-94-03 because of the correlation coefficient value being outside of the control limit or high duplicate sample RPDs.

All SWMU 15 RUST08 gumweed data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 15 that were selected for the DQA comprised SDG RUST10 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 15 samples were composited with samples from SWMU 12 in SDG RUST10.

Sample Delivery Group RUST10 Grasshopper Results

No qualifiers were assigned to the pesticide data.

Several dioxins and furans were qualified with a "UJ" in sample EG7-95-01C because of low internal standard recoveries. These low recoveries also resulted in qualifying the following compounds with an "R" for sample EG7-95-01C: 2,3,7,8-TCDD; 1,2,3,7,8-PeCDD; 2,3,7,8-TCDF; 1,2,3,7,8-PeCDF; and the accompanying totals. The compounds OCDD and OCDF were qualified with a "J" or a "UJ" in three samples because of internal standard recoveries being outside of the control limits.

For the metals, arsenic and selenium were qualified with a "J" or a "UJ" in five samples, while lead was qualified with a "J" in sample EG7-95-05C because of the analytical spike recovery values being outside of the control limits.

All SWMU 15 RUST10 grasshopper data were acceptable for use, and all data requirements were met with the exception of the rejected dioxins and furans noted above (i.e., there was insufficient sample material remaining for reanalysis).

Sample Delivery Group RUST10 Beetle Results

No qualifiers were assigned to the dioxin/furan data.

The pesticide 4,4'-DDT was qualified with a "J" in sample EL7-95-01C because of poor agreement between the primary and confirmation column results and because of high laboratory control sample recoveries.

For the metals, antimony was qualified with a "U" in sample EL7-95-01C because of blank contamination while selenium was qualified with a "J" in the same sample because of the analytical spike recovery values being outside of the control limits.

All SWMU 15 RUST10 beetle data were acceptable for use, and all data requirements were met.

SWMU 21

Soils Summary. The soil samples collected at SWMU 21 that were selected for the DQA were analyzed for the following parameters:

- ICP metals, using method JS12
- Selenium, using method JD20
- Mercury, using method Y9

One lot of ICP metals analyses was reviewed. Barium and chromium were qualified as rejected as a result of low MS/MSD recoveries in one sample duplicate. With the exception of the rejected data, all metals data were acceptable for use, and all data requirements were met.

One lot of selenium analyses was reviewed. One sample duplicate was qualified with a "UJ" as a result of low MS/MSD recoveries. All selenium data were acceptable for use, and all data requirements were met.

One lot of mercury analyses was reviewed. No qualifiers were assigned to the mercury data. All data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 21 consisted of rabbitbrush, gumweed, grasshoppers, and beetles.

The rabbitbrush samples collected at SWMU 21 that were selected for the DQA comprised SDG RUST04 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST04 Results

No qualifiers were assigned to the pesticide or herbicide data.

Several PAHs were qualified with a "J" in two samples as a result of continuing calibration problems.

Total HpCDF was qualified with a "J" in sample EB9-94-01 because of continuing calibration problems, while OCDD and OCDF were qualified with a "J" and a "UJ" in EB9-94-02 because of low internal standard recoveries. The initial column result for the furan 2,3,7,8-TCDF was qualified with an "R" in sample EB9-94-01. However, the confirmatory column results were not qualified and were used.

The explosive RDX was qualified with a "UJ" in two samples as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in the same samples with a "J" or a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still as the qualifiers were considered when interpreting the data.

For the metals, beryllium was qualified with a "U" in two samples as a result of blank contamination, while lead ("J") and mercury ("J" or "UJ") results were qualified in the same two samples as a result of low MS/MSD recoveries and high duplicate sample RPDs,

respectively. Arsenic and cadmium were qualified with a "J" because of the analytical spike recovery values being outside of the control limits.

All SWMU 21 RUST04 rabbitbrush data were acceptable for use, and all data requirements were met, with the following exceptions: (1) some of the explosives, where data accuracy was determined to be outside of control limits, and (2) 2,3,7,8-TCDF in one sample, where the initial column result was rejected.

The gumweed samples collected at SWMU 21 that were selected for the DQA comprised SDG RUST08 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST08 Results

No qualifiers were assigned to the SVOC, pesticide, or herbicide data.

The furans 2,3,7,8-TCDF (one sample) and 2,3,4,6,7,8-HxCDF (two samples) were qualified with a "U" because of blank contamination.

The explosive 2,4,6-TNT was qualified with a "UJ" in two samples as a result of low laboratory control sample recoveries.

For the metals, beryllium (two samples) and antimony (one sample) were qualified with a "U" as a result of blank contamination, while silver and cadmium were qualified with a "UJ" and a "J", respectively, in two samples because of MS/MSD analyses being outside of control limits. Cadmium and selenium results were also qualified with a "J" or a "UJ" in two samples because of the analytical spike recovery values being outside of the control limits or high duplicate sample RPDs.

All SWMU 21 RUST08 gumweed data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 21 that were selected for the DQA comprised SDG RUST10 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101

- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 21 samples were composited with samples from SWMU 37 in SDG RUST10.

<u>Sample Delivery Group RUST10 Grasshopper Results</u>

The pesticide 4,4'-DDT was qualified with a "J" or a "UJ" in two samples because of poor agreement between the primary and confirmation column results or because of high laboratory control sample recoveries.

The compounds OCDD and OCDF were qualified with a "UJ" in four samples because of low internal standard recoveries.

For the metals, arsenic (four samples) and selenium (three samples) were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits, while antimony was qualified with a "U" in two samples because of blank contamination.

All SWMU 21 RUST10 grasshopper data were acceptable for use, and all data requirements were met.

<u>Sample Delivery Group RUST10 Beetle Results</u>

The pesticide 4,4'-DDT was qualified with a "J" in sample EL9-95-01C because of poor agreement between the primary and confirmation column results and because of high laboratory control sample recoveries, while 4,4'-DDE was qualified with a "J" in the same sample as a result of high laboratory control sample recoveries.

The compounds OCDD and OCDF were qualified with a "UJ" in sample EL9-95-01C because of low internal standard recoveries, while several furans were qualified with a "U" or a "UJ" in sample EL9-95-02C as a result of blank contamination or because of low internal standard recoveries.

For the metals, antimony was qualified with a "U" in sample EL9-95-01C because of blank contamination.

All SWMU 21 RUST10 beetle data were acceptable for use, and all data requirements were met.

<u>SWMU 37</u>

Soils Summary. The soil samples collected at SWMU 37 that were selected for the DQA were

analyzed for the following parameters:

- ICP metals, using method JS12
- Selenium, using method JD20
- Mercury, using method Y9

One lot of ICP metals analyses was reviewed. No qualifiers were assigned to the metals data. All ICP metals data were acceptable for use, and all data requirements were met.

One lot of selenium analyses was reviewed. One sample was qualified with a "UJ" as a result of low MS/MSD recoveries. All selenium data were acceptable for use, and all data requirements were met.

One lot of mercury analyses was reviewed. No qualifiers were assigned to the mercury data. All data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 37 consisted of rabbitbrush, sweetclover, ambrosia, grasshoppers, and beetles.

The rabbitbrush samples collected at SWMU 37 that were selected for the DQA comprised SDG RUST04 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

<u>Sample Delivery Group RUST04 Results</u>

No qualifiers were assigned to the pesticide or herbicide data.

Several PAHs were qualified with a "J" in two samples as a result of continuing calibration problems.

A total of three furans in two samples were qualified with a "J" because of continuing calibration problems.

The explosive RDX was qualified with a "UJ" in two samples as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in the same samples with a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of

control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data.

For the metals, beryllium was qualified with a "U" in two samples as a result of blank contamination, while lead ("J") and mercury ("UJ") results were qualified in the same two samples as a result of low MS/MSD recoveries and high duplicate sample RPDs, respectively. Arsenic, cadmium, and selenium were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits.

All SWMU 37 RUST04 rabbitbrush data were acceptable for use, and all data requirements were met with the exception of some of the explosives, where data accuracy was determined to be outside of control limits.

The sweetclover samples collected at SWMU 37 that were selected for the DQA comprised SDG RUST06 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST06 Results

No qualifiers were assigned to the PAH, pesticide, explosive, or herbicide data.

The furan 1,2,3,4,6,7,8-HpCDF in sample ECA-94-01 was qualified with a "U" because of detections in the associated method blank, while OCDD and OCDF were qualified with a "J" and a "UJ", respectively, in sample ECA-94-02 as a result of low internal standard recoveries.

For the metals, beryllium (two samples) was qualified with a "U" as a result of blank contamination, while silver and cadmium were qualified with a "J" or a "UJ" in a few samples because of MS/MSD analyses being outside of control limits. The ECA-94-01 cadmium result was qualified with a "J" because of the analytical spike recovery values being outside of control limits.

All SWMU 37 RUST06 sweetclover data were acceptable for use, and all data requirements were met.

The ambrosia samples collected at SWMU 37 that were selected for the DQA comprised SDG RUST09 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST09 Results

No qualifiers were assigned to the PAH, pesticide, or herbicide data.

The furans 2,3,7,8-TCDF and 2,3,4,6,7,8-HxCDF were qualified with a "U" in sample EAA-94-02 because of blank contamination.

The explosive 2,4,6-TNT was qualified with a "UJ" in sample EAA-94-02 as a result of low laboratory control sample recoveries.

For the metals, beryllium was qualified with a "J" in sample EAA-94-02 as a result of detections in the interference check sample solutions, while cadmium was qualified with a "UJ" in the same because of the analytical spike recovery values being outside of the control limits.

All SWMU 37 RUST09 ambrosia data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 37 that were selected for the DQA comprised SDG RUST10 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 37 samples were composited with samples from SWMU 21 in SDG RUST10.

Sample Delivery Group RUST10 Grasshopper Results

The pesticide 4,4'-DDT was qualified with a "J" or a "UJ" in two samples because of poor agreement between the primary and confirmation column results or because of high laboratory control sample recoveries.

The compounds OCDD and OCDF were qualified with a "UJ" in four samples because of low internal standard recoveries.

For the metals, arsenic (four samples) and selenium (three samples) were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits, while antimony was qualified with a "U" in two samples because of blank contamination.

All SWMU 37 RUST10 grasshopper data were acceptable for use, and all data requirements were met.

Sample Delivery Group RUST10 Beetle Results

The pesticide 4,4'-DDT was qualified with a "J" in sample EL9-95-01C because of poor agreement between the primary and confirmation column results and because of high laboratory control sample recoveries, while 4,4'-DDE was qualified with a "J" in the same sample as a result of high laboratory control sample recoveries.

The compounds OCDD and OCDF were qualified with a "UJ" in sample EL9-95-01C because of low internal standard recoveries, while several furans were qualified with a "U" or a "UJ" in sample EL9-95-02C as a result of blank contamination or because of low internal standard recoveries.

For the metals, antimony was qualified with a "U" in sample EL9-95-01C because of blank contamination.

All SWMU 37 RUST10 beetle data were acceptable for use, and all data requirements were met.

SWMU 42

Soils Summary. The soil samples collected at SWMU 42 that were selected for the DQA were analyzed for the following parameters:

- Arsenic, using method B9
- PCBs/Pesticides, using method LH17
- Dioxins/Furans, using method 8280

One lot of arsenic analyses was reviewed. No qualifiers were assigned to the arsenic data. All data were acceptable for use, and all data requirements were met.

One lot of PCBs/pesticides analyses was reviewed. No qualifiers were assigned to the PCBs/pesticides data. All data were acceptable for use, and all data requirements were met.

One lot of dioxin/furan analyses was reviewed. The dioxin 2378 TCDD was qualified with a "U" in three samples as a result of a detection in the associated equipment rinse blank. All dioxin/furan data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 42 consisted of rabbitbrush, sweetclover, gumweed, grasshoppers, and beetles.

The rabbitbrush samples collected at SWMU 42 that were selected for the DQA comprised SDGs RUST03 and RUST04 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

<u>Sample Delivery Group RUST03 Results</u>

Several PAHs from two samples were rejected because of calibration range problems. Because a dilution and reanalysis was performed successfully, a usable result existed for all of the target compounds, and the unqualified data set were acceptable for use.

The pesticide 4,4'-DDE was qualified with a "J" in two samples because of high percent differences between the primary and secondary column results.

The furan 2,3,4,6,7,8-HxCDF was qualified with a "U" in two samples because of detections in the associated method blank.

The explosive RDX was qualified with a "UJ" in all samples as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in all samples with a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data, where matrix interferences were present.

No qualifiers were assigned to the herbicide data.

For the metals, beryllium (two samples) was qualified with a "U" as a result of blank contamination, while all lead results were qualified with a "J" as a result of low MS/MSD recoveries. Cadmium and selenium were qualified with a "J" or a "UJ" in several samples because of the analytical spike recovery values being outside of the control limits.

Several PAHs from two samples were rejected because of calibration range problems. Because a dilution and reanalysis was performed successfully, a usable result existed for all of the target compounds, and the unqualified data set was acceptable for use.

All other SWMU 42 RUST03 rabbitbrush data were acceptable for use, and all data requirements were met, with the exception of some of the explosives, where data accuracy was determined to be outside of control limits.

Sample Delivery Group RUST04 Results

Phenanthrene, pyrene, and chrysene were qualified with a "J" in two samples because of high percent differences in continuing calibration standards. Several PAHs from four samples were rejected because of calibration range problems. Because a dilution and reanalysis was performed successfully, a usable result existed for all of the target compounds, and the unqualified data set was acceptable for use.

The pesticide 4,4'-DDE was qualified with a "J" in two samples because of high percent differences between the primary and secondary column results.

OCDD and OCDF were qualified with a "J" or a "UJ" in one sample because of low internal standard recoveries.

The explosive RDX was qualified with a "UJ" in six samples as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in the same six samples with a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data, where matrix interferences were present.

No qualifiers were assigned to the herbicide data.

For the metals, beryllium (six samples) was qualified with a "U" as a result of blank contamination, while all lead and mercury results were qualified with a "J" as a result of low MS/MSD recoveries and high duplicate sample RPDs, respectively. Arsenic, cadmium, and selenium were qualified with a "J" or a "UJ" in several samples because of the analytical spike recovery values being outside of the control limits.

All SWMU 42 RUST04 rabbitbrush data were acceptable for use, and all data requirements were met with the exception of some of the explosives, where data accuracy was determined to be outside of control limits. Three PAHs from two samples were rejected because of calibration range problems. However, because a dilution and reanalysis was performed successfully, a usable result existed for all of the target compounds, and the unqualified data set was acceptable for use.

The sweetclover samples collected at SWMU 42 that were selected for the DQA comprised SDGs RUST06 and RUST07 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101

- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST06 Results

No qualifiers were assigned to the PAH, pesticide, or herbicide data.

A few furans in seven samples were qualified with a "U" because of detections in the associated method blank, while OCDD and OCDF were qualified with a "UJ" in one sample as a result of low internal standard recoveries.

RDX and 2,4,6-TNT were qualified in two samples with a "UJ" because of low surrogate percent recoveries.

For the metals, beryllium (seven samples) was qualified with a "U" as a result of blank contamination, while silver and cadmium were qualified with a "J" or a "UJ" in the same seven samples because of MS/MSD analyses being outside of control limits. Several arsenic, antimony, and selenium results were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits.

All SWMU 42 RUST06 sweetclover data were acceptable for use, and all data requirements were met.

Sample Delivery Group RUST07 Results

No qualifiers were assigned to the pesticide, explosive, or herbicide data.

Three PAHs were qualified with a "J" in sample EC1-94-08 because of problems with the associated method blank.

The dioxin OCDD was qualified with a "U" in sample EC1-94-08 because of detections in the associated method blank.

For the metals, beryllium (sample EC1-94-08) was qualified with a "U" as a result of blank contamination, while silver was qualified with a "UJ" in the same sample because of MS/MSD analyses being outside of control limits.

All SWMU 42 RUST07 sweetclover data were acceptable for use, and all data requirements were met.

The gumweed samples collected at SWMU 42 that were selected for the DQA comprised SDG RUST08 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST08 Results

No qualifiers were assigned to the PAH, pesticide, dioxin/furan, or herbicide data.

The explosive 2,4,6-TNT was qualified with a "UJ" in sample EM1-94-07 as a result of low laboratory control sample recoveries.

For the metals, beryllium and antimony in sample EM1-94-07 were qualified with a "U" as a result of blank contamination, while silver and cadmium were qualified in the same sample with a "UJ" and a "J", respectively, because of MS/MSD analyses being outside of control limits. The cadmium and selenium results for EM1-94-07 were also qualified with a "J" and a "UJ", respectively, because of the analytical spike recovery values being outside of the control limits or high duplicate sample RPDs.

All SWMU 42 RUST08 gumweed data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 42 that were selected for the DQA comprised SDG RUST11 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 42 samples were composited with samples from SWMU 45 in SDG RUST11.

Sample Delivery Group RUST11 Grasshopper Results

The pesticides 4,4'-DDE (two samples) and 4,4'-DDT (one sample) were qualified with a "J"

because of poor agreement between the primary and confirmation column results, and high laboratory control sample recoveries or because of continuing calibration problems.

The compounds OCDD and OCDF were qualified with a "UJ" in sample EG1-95-03C because of low internal standard recoveries or blank contamination. The furan 2,3,4,6,7,8-HxCDF was qualified with a "U" in two samples as a result of blank contamination.

For the metals, arsenic and selenium were qualified with a "J" or a "UJ" in three samples because of the analytical spike recovery values being outside of the control limits.

All SWMU 42 RUST11 grasshopper data were acceptable for use, and all data requirements were met.

Sample Delivery Group RUST11 Beetle Results

The pesticides 4,4'-DDE and 4,4'-DDT were qualified with a "J" in two samples because of poor agreement between the primary and confirmation column results or because of high laboratory control sample recoveries.

The compounds OCDD, OCDF, and 1,2,3,4,6,7,8-HpCDF were qualified with a "U" or a "UJ" in sample EL1-95-01C because of low internal standard recoveries or blank contamination.

For the metals, arsenic and selenium were qualified with a "J" in sample EL1-95-02C because of the analytical spike recovery values being outside of the control limits.

All SWMU 42 RUST11 beetle data were acceptable for use, and all data requirements were met.

SWMU 45

Soils Summary. The soil samples collected at SWMU 45 that were selected for the DQA were analyzed for the following parameters:

- PCBs/Pesticides, using method LH17
- Explosives, using method LW23

One lot of PCBs/pesticides analyses was reviewed. No qualifiers were assigned to the PCBs/pesticides data. All data were acceptable for use, and all data requirements were met.

One lot of explosives analyses was reviewed. No qualifiers were assigned to the explosives. All data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 45 consisted of jackrabbit, rabbitbrush, sweetclover, gumweed, grasshoppers, and beetles.

The jackrabbit samples collected at SWMU 45 that were selected for the DQA comprised SDG RUST02 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST02 Results

The PAHs phenanthrene (two samples) and pyrene (one sample) were qualified with a "U" because of detections in the associated method blank samples.

No qualifiers were assigned to the pesticides data.

The dioxins/furans results from samples EJ2-94-01 and EJ2-94-02 were rejected because of extraction problems. However, the re-extraction and subsequent analyses were acceptable, and none of the rerun data were qualified. Therefore, a usable result existed for all of the target compounds, and the data were acceptable for use.

No qualifiers were assigned to the herbicide data.

For the metals, beryllium was qualified with a "U" in several samples as a result of blank contamination. Arsenic, selenium, and silver were qualified with a "U" or a "UJ" in several samples as a result of low MS/MSD recoveries, while antimony, arsenic, cadmium, and selenium were qualified with a "U" or a "UJ" in several samples because of the analytical spike recovery values being outside of the control limits.

All SWMU 45 jackrabbit data were acceptable for use, and all data requirements were met.

The rabbitbrush samples collected at SWMU 45 that were selected for the DQA comprised SDG RUST04 and RUST05 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST

- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST04 Results

No qualifiers were assigned to the PAH, pesticide, dioxin/furan, or herbicide data.

The explosive RDX was qualified with a "UJ" in one sample as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in the same sample with a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data.

For the metals, beryllium was qualified with a "U" as a result of blank contamination, while the lead and mercury results were qualified with a "J" as a result of low MS/MSD recoveries and high duplicate sample RPDs, respectively. Arsenic and cadmium were qualified with a "J" because of the analytical spike recovery values being outside of the control limits.

All SWMU 45 RUST04 rabbitbrush data were acceptable for use, and all data requirements were met with the exception of some of the explosives, where data accuracy was determined to be outside of control limits.

Sample Delivery Group RUST05 Results

No qualifiers were assigned to the PAH or pesticide data.

A few dioxins and furans were qualified with a "U" in two samples because of detections in the associated method blank.

The explosives RDX and 2,4,6-TNT were qualified with a "UJ" in four samples as a result of low MS/MSD recoveries and low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data.

The herbicide 2,4-D was qualified with a ""J" in samples EB2-94-05 and -06 because of high percent differences in the second column confirmation analysis.

For the metals, beryllium (three samples) was qualified with a "U" as a result of blank contamination, while silver, cadmium, and selenium were qualified with a "J" or a "UJ" in four samples because of MS/MSD analyses being outside of control limits. Cadmium was also qualified in four samples with a "J" as a result of high duplicate sample RPD values. A few arsenic, antimony, and selenium results were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits.

All SWMU 45 RUST05 rabbitbrush data were acceptable for use, and all data requirements

were met with the exception of some of the explosives, where data accuracy was determined to be outside of control limits.

The sweetclover samples collected at SWMU 45 that were selected for the DQA comprised SDG RUST06 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST06 Results

No qualifiers were assigned to the PAH, pesticide, explosive, or herbicide data.

Three furans in sample EC2-94-03 were qualified with a "U" because of detections in the associated method blank.

For the metals, beryllium (three samples) was qualified with a "U" as a result of blank contamination. Silver and cadmium were qualified with a "J" or a "UJ" in a few samples because of MS/MSD analyses being outside of control limits, while some of the arsenic, cadmium, and selenium results were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits.

All SWMU 45 RUST06 sweetclover data were acceptable for use, and all data requirements were met.

The gumweed samples collected at SWMU 45 that were selected for the DQA comprised SDG RUST08 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST

- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST08 Results

No qualifiers were assigned to the pesticide or herbicide data.

The PAHs phenanthrene, fluoranthene, and pyrene were qualified with a "J" in sample EM2-94-01 because of high surrogate percent recoveries.

The furans 2,3,7,8-TCDF (one sample) and 2,3,4,6,7,8-HxCDF (three samples) were qualified with a "U" because of blank contamination.

The explosive 2,4,6-TNT was qualified with a "UJ" in three samples as a result of low laboratory control sample recoveries.

For the metals, beryllium and antimony were qualified in three samples with a "U" as a result of blank contamination, while silver (three samples) and cadmium (one sample) were qualified with a "UJ" and a "J", respectively, because of MS/MSD analyses being outside of control limits. Three cadmium and selenium results were also qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits or high duplicate sample RPDs. Arsenic was qualified with a "J" in sample EM2-94-02 because of the analytical spike recovery values being outside of the control limits.

All SWMU 45 RUST08 gumweed data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 45 that were selected for the DQA comprised SDG RUST11 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 45 samples were composited with samples from SWMU 42 in SDG RUST11.

Sample Delivery Group RUST11 Grasshopper Results

The pesticides 4,4'-DDE (two samples) and 4,4'-DDT (one sample) were qualified with a "J" because of poor agreement between the primary and confirmation column results and high laboratory control sample recoveries or because of continuing calibration problems.

The compounds OCDD and OCDF were qualified with a "UJ" in sample EG1-95-03C because of low internal standard recoveries or blank contamination. The furan 2,3,4,6,7,8-HxCDF was qualified with a "U" in two samples as a result of blank contamination.

For the metals, arsenic and selenium were qualified with a "J" or a "UJ" in three samples because of the analytical spike recovery values being outside of the control limits.

All SWMU 45 RUST11 grasshopper data were acceptable for use, and all data requirements were met.

Sample Delivery Group RUST11 Beetle Results

The pesticides 4,4'-DDE and 4,4'-DDT were qualified with a "J" in two samples because of poor agreement between the primary and confirmation column results or because of high laboratory control sample recoveries.

The compounds OCDD, OCDF, and 1,2,3,4,6,7,8-HpCDF were qualified with a "U" or a "UJ" in sample EL1-95-01C because of low internal standard recoveries or blank contamination.

For the metals, arsenic and selenium were qualified with a "J" in sample EL1-95-02C because of the analytical spike recovery values being outside of the control limits.

All SWMU 45 RUST11 beetle data were acceptable for use, and all data requirements were met.

SWMU 1B

Soils Summary. The soil samples collected at SWMU 1B that were selected for the DQA were analyzed for the following parameters:

- PCBs/pesticides, using method LH17
- Explosives, using method LW23
- Mercury, using method Y9

One lot of PCBs/pesticides analyses was reviewed. No qualifiers were assigned to the PCBs/pesticides data. All data were acceptable for use, and all data requirements were met.

One lot of explosives analyses was reviewed. No qualifiers were assigned to the explosives. All data were acceptable for use, and all data requirements were met.

One lot of mercury analyses was reviewed. No qualifiers were assigned to the mercury. All data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 1B consisted of rabbitbrush, gumweed, grasshoppers, and beetles.

The rabbitbrush samples collected at SWMU 1B that were selected for the DQA comprised SDG RUST05 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST05 Results

No qualifiers were assigned to the PAH, pesticide, or herbicide data.

The dioxin OCDD was qualified with a "U" in EB3-94-01 because of a detection in the associated method blank, while several dioxins and furans were qualified with a "UJ" in EB3-94-02 because of low internal standard recoveries.

The explosives RDX and 2,4,6-TNT were qualified with a "UJ" in two samples as a result of low MS/MSD recoveries and low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data.

For the metals, beryllium (two samples) was qualified with a "U" as a result of blank contamination, while silver, cadmium, and selenium were qualified with a "J" or a "UJ" in the same two samples because of MS/MSD analyses being outside of control limits. Cadmium was also qualified in two samples with a "J" as a result of high duplicate sample RPD values. A few arsenic, antimony, cadmium, and selenium results were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits.

All SWMU 1B RUST05 rabbitbrush data were acceptable for use, and all data requirements were met with the exception of some of the explosives, where data accuracy was determined to be outside of control limits.

The gumweed samples collected at SWMU 1B that were selected for the DQA comprised SDG RUST08 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST

- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST08 Results

No qualifiers were assigned to the PAH, pesticide, or herbicide data.

The furan 2,3,7,8-TCDF was qualified with a "U" in sample EM3-94-01 because of blank contamination.

The explosive 2,4,6-TNT was qualified with a "UJ" in two samples as a result of low laboratory control sample recoveries.

For the metals, beryllium and antimony were qualified in two samples with a "U" as a result of blank contamination, while silver (two samples) and cadmium (one sample) were qualified with a "UJ" and a "J", respectively, because of MS/MSD analyses being outside of control limits. Cadmium (two samples), selenium (two samples), and lead (one sample) results were also qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits or high duplicate sample RPDs. Arsenic was qualified with a "J" in sample EM2-94-02 because of the analytical spike recovery values being outside of the control limits.

All SWMU 1B RUST08 gumweed data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 1B that were selected for the DQA comprised SDG RUST10 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 1B samples were composited with samples from SWMU 1C in SDG RUST10.

Sample Delivery Group RUST10 Grasshopper Results

No qualifiers were assigned to the pesticide data.

The furan 2,3,4,6,7,8-HxCDF was qualified with a "U" in sample EG3-95-02C as a result of blank contamination.

For the metals, arsenic (two samples) and selenium (one sample) were qualified with a "UJ" and a "J", respectively, because of the analytical spike recovery values being outside of the control limits.

All SWMU 1B RUST10 grasshopper data were acceptable for use, and all data requirements were met.

Sample Delivery Group RUST10 Beetle Results

No qualifiers were assigned to the pesticide or dioxin/furan data.

For the metals, arsenic was qualified with a "J" in sample EL3-95-01C because of the analytical spike recovery values being outside of the control limits.

All SWMU 1B RUST10 beetle data were acceptable for use, and all data requirements were met.

SWMU 1C

Soils Summary. The soil samples collected at SWMU 1C that were selected for the DQA were analyzed for the following parameters:

- PCBs/pesticides using method LH17
- Explosives using method LW23
- Mercury using method Y9

One lot of PCBs/pesticides analyses was reviewed. No qualifiers were assigned to the PCBs/pesticides data. All data were acceptable for use, and all data requirements were met.

One lot of explosives analyses was reviewed. No qualifiers were assigned to the explosives. All data were acceptable for use, and all data requirements were met.

One lot of mercury analyses was reviewed. No qualifiers were assigned to the mercury. All data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at SWMU 1C consisted of rabbitbrush, gumweed, grasshoppers, and beetles.

The rabbitbrush samples collected at SWMU 1C that were selected for the DQA comprised SDG RUST05 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA

- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST05 Results

No qualifiers were assigned to the PAH or herbicide data.

The pesticide 4,4'-DDE was qualified with a "J" in sample EB4-94-02 because of high percent differences between the primary and secondary column results.

The compounds OCDD; 2,3,7,8-TCDF; and 2,3,4,6,7,8-HxCDF were qualified with a "U" in sample EB4-94-01 because of a detection in the associated method blank, while OCDD and OCDF were qualified with a "UJ" in EB4-94-02 because of low internal standard recoveries. The initial extraction results for all compounds were qualified with an "R" in sample EB4-94-02 because of problems during the extraction process. A re-extraction and re-analysis was performed without complication. The results from the re-analysis were used.

The explosives RDX and 2,4,6-TNT were qualified with a "UJ" in two samples as a result of low MS/MSD recoveries and low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. However, the data were still used as the qualifiers were considered when interpreting the data, where matrix interferences were present.

For the metals, beryllium (two samples) was qualified with a "U" as a result of blank contamination, while silver, cadmium, and selenium were qualified with a "J" or a "UJ" in the same two samples because of MS/MSD analyses being outside of control limits. Cadmium was also qualified in two samples with a "J" as a result of high duplicate sample RPD values. Two antimony and selenium results were qualified with a "UJ" because of the analytical spike recovery values being outside of the control limits.

All SWMU 1C RUST05 rabbitbrush data were acceptable for use, and all data requirements were met with the following exceptions: (1) of some of the explosives, where data accuracy was determined to be outside of control limits, and (2) the dioxins/furans in EB4-94-02, where the initial extraction results were rejected.

The gumweed samples collected at SWMU 1C that were selected for the DQA comprised SDG RUST08 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA

- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST08 Results

No qualifiers were assigned to the PAH, pesticide, or herbicide data.

The furan 2,3,4,6,7,8-HxCDF was qualified with a "U" in sample EM4-94-01 because of blank contamination, while total HpCDF was qualified with a "J" in sample EM4-94-02 because of high percent differences in continuing calibration standards.

The explosive 2,4,6-TNT was qualified with a "UJ" in two samples as a result of low laboratory control sample recoveries.

For the metals, beryllium was qualified in two samples with a "U" as a result of blank contamination, while silver was qualified in the same two samples with a "UJ" because of MS/MSD analyses being outside of control limits. Cadmium (two samples), selenium (two samples), and lead (one sample) results were also qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits or high duplicate sample RPDs.

All SWMU 1C RUST08 gumweed data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at SWMU 1C that were selected for the DQA comprised SDG RUST10 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

It is important to note that the SWMU 1C samples were composited with samples from SWMU 1B in SDG RUST10.

Sample Delivery Group RUST10 Grasshopper Results

No qualifiers were assigned to the pesticide data.

The furan 2,3,4,6,7,8-HxCDF was qualified with a "U" in sample EG3-95-02C as a result of blank contamination.

For the metals, arsenic (two samples) and selenium (one sample) were qualified with a "UJ" and a "J", respectively, because of the analytical spike recovery values being outside of the control limits.

All SWMU 1C RUST10 grasshopper data were acceptable for use, and all data requirements were met.

Sample Delivery Group RUST10 Beetle Results

No qualifiers were assigned to the pesticide or dioxin/furan data.

For the metals, arsenic was qualified with a "J" in sample EL3-95-01C because of the analytical spike recovery values being outside of the control limits.

All SWMU 1C RUST10 beetle data were acceptable for use, and all data requirements were met.

Reference Study Area

Soils Summary. The soil samples collected at the RSA that were selected for the DQA were analyzed for the following parameters:

- Cyanide, using method KY15
- Dioxins/Furans, using method 8280

One lot of cyanide analyses was reviewed. No qualifiers were assigned to the cyanide. All data were acceptable for use, and all data requirements were met.

One lot of dioxin/furan analyses was reviewed. The dioxins OCDD and OCDF were qualified with a "J" or "UJ" in two samples and one duplicate from the RSA as a result of low 13C-OCDD recoveries. All dioxin/furan data were acceptable for use, and all data requirements were met.

Biota Summary. The biota chosen for the DQA at the RSA consisted of jackrabbit, rabbitbrush, sweetclover, gumweed, grasshoppers, and beetles.

The jackrabbit samples collected at the RSA that were selected for the DQA comprised SDG RUST01 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST01 Results

The PAH phenanthrene was qualified with a "U" for all samples because of detections in the associated method blank sample.

No qualifiers were assigned to the pesticide data.

The furans 2,3,4,6,7,8-HxCDF and 2,3,7,8-TCDF were qualified with a "U" in one sample each because of detections in the associated method blank.

No qualifiers were assigned to the herbicide data.

For the metals, beryllium (several samples) and vanadium (three samples) were qualified with a "U" and arsenic was qualified with a "UJ" in two samples as a result of blank contamination. All of the selenium and silver results were qualified with a "U" or a "UJ" as a result of low MS/MSD recoveries, while antimony, cadmium, lead, and selenium were qualified with a "U" or a "UJ" in several samples because of the analytical spike recovery values being outside of the control limits.

All RSA jackrabbit data were acceptable for use, and all data requirements were met.

The rabbitbrush samples collected at the RSA that were selected for the DQA comprised SDG RUST03 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST03 Results

The PAH pyrene was qualified with a "U" for one sample because of a detection in the associated method blank sample.

The pesticide 4,4'-DDE was qualified with a "J" in three samples because of high percent differences between the primary and secondary column results.

The furan 2,3,4,6,7,8-HxCDF was qualified with a "U" in two samples because of detections in the associated method blank. Several dioxins/furans were qualified with a "UJ" because of low internal standard recovery values.

The explosive RDX was qualified with a "UJ" in all samples as a result of low MS/MSD recoveries, while RDX and 2,4,6-TNT were qualified in all samples with a "J" or a "UJ" because of low laboratory control sample recoveries. Accuracy was determined to be outside of control limits based on these low recoveries. The data were still used as the qualifiers were considered when interpreting the data.

No qualifiers were assigned to the herbicide data.

For the metals, beryllium (several samples) was qualified with a "U" as a result of blank contamination, while all lead results were qualified with a "J" as a result of low MS/MSD recoveries. Arsenic, cadmium, lead, and selenium were qualified with a "J" or a "UJ" in several samples because of the analytical spike recovery values being outside of the control limits.

All RSA rabbitbrush data were acceptable for use, and all data requirements were met with the exception of some of the explosives where data accuracy was determined to be outside of control limits.

The sweetclover samples collected at the RSA that were selected for the DQA comprised SDG RUST07 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

<u>Sample Delivery Group RUST07 Results</u>

No qualifiers were assigned to the pesticide or herbicide data.

The PAHs phenanthrene, fluoranthene, and pyrene were qualified with a "J" in several samples, and chrysene was qualified with a "J" in ECB-94-10 as a result of problems with the associated method blank.

The compounds OCDD and 2,3,7,8-TCDF were qualified with a "U" in 11 samples because of detections in the associated method blank, while several dioxins and furans were qualified with a "UJ" in ECB-94-05 as a result of low internal standard recoveries.

RDX and 2,4,6-TNT were qualified in three samples with a "J" or a "UJ" because of low surrogate percent recoveries.

For the metals, beryllium (15 samples) was qualified with a "U" as a result of blank contamination, while silver was qualified with a "UJ" in the same 15 samples because of MS/MSD analyses being outside of control limits. Several arsenic, cadmium, selenium, and lead (one sample) results were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits. Lead was qualified with a "J" in sample ECB-94-04 because of the percent relative standard deviation value being greater than the control limit.

All RSA RUST07 sweetclover data were acceptable for use, and all data requirements were met.

The gumweed samples collected at the RSA that were selected for the DQA comprised SDGs RUST08 and RUST09 and were analyzed for the following parameters:

- PAHs, using method MP-PRST-MA
- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- Explosives (2,4,6-TNT and RDX), using method MP-ERST-MA
- Herbicides (2,4-D), using method MP-RUSTH-MA
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

<u>Sample Delivery Group RUST08 Results</u>

No qualifiers were assigned to the pesticide or herbicide data.

Several PAHs were qualified with a "UJ" in sample EMB-94-05 because of the sample going dry during soxhlet extraction.

The furans 2,3,7,8-TCDF (one sample) and 2,3,4,6,7,8-HxCDF (two samples) were qualified with a "U"because of blank contamination.

The explosive 2,4,6-TNT was qualified with a "UJ" in three samples as a result of low laboratory control sample recoveries.

For the metals, beryllium (four samples) and antimony (one sample) were qualified with a "U" as a result of blank contamination, while silver (four samples) and cadmium (three samples) were qualified with a "UJ" and a "J", respectively, because of MS/MSD analyses being outside of control limits. Cadmium and selenium were also qualified with a "J" or a "UJ" in four samples because of the analytical spike recovery values being outside of the control limits or high duplicate sample RPDs.

All RSA RUST08 gumweed data were acceptable for use, and all data requirements were met.

Sample Delivery Group RUST09 Results

No qualifiers were assigned to the pesticide or herbicide data.

The PAH phenanthrene was qualified with a "J" in sample EMB-94-12 because of high surrogate percent recoveries.

The dioxin OCDD was qualified with a "U" because of blank contamination.

The explosive 2,4,6-TNT was qualified with a "UJ" in three samples as a result of low laboratory control sample recoveries.

For the metals, beryllium (three samples) was qualified with a "J" as a result of detections in the interference check sample solutions, while cadmium (two samples) and selenium (one sample) were qualified with a "UJ" because of the analytical spike recovery values being outside of the control limits.

All RSA RUST09 gumweed data were acceptable for use, and all data requirements were met.

The grasshopper and beetle samples collected at the RSA that were selected for the DQA comprised SDG RUST11 and were analyzed for the following parameters:

- Pesticides (p,p'-DDE and p,p'-DDT), using method MP-RUSTP-MA
- Dioxins/furans, using method SOP DHR182 (8290), SOP XXZ100, and SOP XXZ101
- ICP metals, using method MP-ICP-RUST
- GFAA metals (As, Cd, Pb, Sb, Se), using various methods
- CVAA mercury, using method MP-HGTA-RUST

Sample Delivery Group RUST11 Grasshopper Results

The pesticides 4,4'-DDE (two samples) and 4,4'-DDT (six samples) were qualified with a "J" or a "UJ" because of poor agreement between the primary and confirmation column results, high laboratory control sample recoveries, or continuing calibration problems.

The compounds OCDD; OCDF; 2,3,4,6,7,8-HxCDF; and total HxCDF were qualified with a "U", "J", or "UJ" in several samples because of low internal standard recoveries or blank contamination.

For the metals, arsenic (10 samples), selenium (5 samples), and lead (3 samples) were qualified with a "J" or a "UJ" because of the analytical spike recovery values being outside of the control limits.

All RSA RUST11 grasshopper data were acceptable for use, and all data requirements were met.

Sample Delivery Group RUST11 Beetle Results

The pesticides 4,4'-DDE (three samples) and 4,4'-DDT (two samples) were qualified with a "J" or a "UJ" because of poor agreement between the primary and confirmation column results or high laboratory control sample recoveries.

The compounds OCDD (two samples), OCDF (one sample), and total TCDD (one sample) were qualified with a "U", "J", or "UJ" because of low internal standard recoveries or blank contamination. These low recoveries also resulted in the qualifying of several dioxins and furans with an "R" in sample ELB-95-03C.

For the metals, arsenic (three samples) and lead (one sample) were qualified with a "J" because of the analytical spike recovery values being outside of the control limits.

All RSA RUST11 beetle data were acceptable for use, and all data requirements were met with the exception of the rejected dioxins and furans noted above (i.e, there was insufficient sample material remaining for reanalysis).

Equipment Rinses

Soils Summary. The equipment rinses that were selected for the DQA were analyzed for the following parameters:

- ICP metals, using method SS12
- Dioxins/furans, using method 8280

One lot of ICP metals analyses was reviewed. No qualifiers were assigned to these metals. All data were acceptable for use, and all data requirements were met.

One lot of dioxin/furan analyses was reviewed. No qualifiers were assigned to the dioxins/furans. All data were acceptable for use, and all data requirements were met.

4.5.3 Evaluation of Data Usability for the Quantitative Risk Assessment

Several data types were collected at TEAD and evaluated for the SWERA. These included surface water; surface water and sediment from SWMU 14; and soil, sediment, and biota data from terrestrial environments at TEAD and the RSA. Biota data and co-located soil data collected from the RSA and TEAD were identified separately as "current data." The DQO guidance was specifically incorporated into the TEAD SWERA field sampling plan (Fall 1994/Fall 1995) and does not apply to past data collection practices herein referred to as "historical data." However, where appropriate, elements of the DQO guidance were addressed relative to the historical data.

Soil and biota data from the RSA and TEAD were collected and evaluated in order to address

the assessment endpoints for the ecological risk assessment (Table 2-2, *Data Quality Objectives for the TEAD Ecological Risk Assessment*). The objectives associated with each of the assessment endpoints focused on determining whether or not effects on ecological receptor populations were measurable from the data collected. Because adverse effects on populations are difficult to measure directly with one season of biometric data, the analytical data for soil, surface water, and tissue were used in conjunction with toxicity information from the literature to predict the presence of adverse effects. Therefore, the data quality objectives for the ecological risk assessment must address the following questions:

- Were the analytical detection limits low enough to be ecotoxicologically relevant (i.e., to be protective of ecological receptors with respect to TBVs)?

- Were sufficient data collected to meet the objectives stated in Table 2-2, *Data Quality Objectives for the TEAD Ecological Risk Assessment?*

4.5.3.1 *Detection Limits Relative to Toxicity Benchmark Values*

In order to determine whether the analytical detection limits were sufficiently low for risk assessment purposes, the CRL or MDL in the appropriate concentration units was multiplied by the appropriate dietary ingestion rate (i.e., soil, water, or biota), and compared to the corresponding TBV in terms of a "comparison value". The comparison value ("comp value") must be less than (or "pass") the TBV for the detection limit to be acceptable. When data were available, individual key receptor pathways were evaluated based upon biota dietary ingestion as prey or forage species, plus soil and surface water ingestion. For example, the deer mouse feeds on seeds, some plants, and invertebrates. The corresponding biota MDLs for rabbitbrush (rb), sweetclover (sc), gumweed (gw), and grasshopper (gh) were multiplied by the dietary ingestion rate for the deer mouse. The schematic used to represent this pathway follows:

deer mouse > **seeds** (using plant data, rb, sc, gw), **invertebrates** (grasshoppers and beetles)

Other receptor pathways are identified below. Detection limits compared to TBVs are presented as tables in Appendix I. These tables summarize the evaluation of detection limits relative to TBVs for soil, surface water, and biota ingestion. The detection limits were sufficiently low if a "yes" appears in the "DL Pass" column for each table. Analytical data were provided for those species in bold type.

passerines > **seeds** (using plant data, rb, sc, gw), **invertebrates** (using grasshopper and beetle data) **and mammal carcass** (using jackrabbit data)

raptor (American kestrel) > **invertebrates** (using grasshopper and beetle data), **jackrabbit/small mammal** (using jackrabbit data)

raptor (Great horned owl, bald eagle, golden eagle) > **jackrabbit/small mammal** (using jackrabbit data)

mule deer > **plants** (using rb, gw, sc data)

jackrabbit > **plants** (using rb, gw, sc data)

kit fox > **jackrabbit/small mammal** (using jackrabbit data), **invertebrates** (using grasshopper and beetle data)

No analytical data on seeds or deer mice were obtained as part of this SWERA scope. However, plant data were used for seeds in avian diet.

Where TBVs or analytical data were available, detection limits were met for all receptors with the exceptions shown in Table 4-11.

In general, interferences produced by both the rabbitbrush and gumweed matrices presented the greatest analytical problems for all types of analyses. The analysis of explosives in any matrix is quite difficult, especially when considering the matrix interferences encountered in rabbitbrush and gumweed. It is also important to note that the incorporation of extensive uncertainty factors into the TBVs resulted in several analytes failing to meet the acceptable comparison value; however, without the additional uncertainty factors, almost all detection limit-TBV combinations were met (Rust E&I 1996).

4.5.3.2 *Soil Data Usability*

The data from the RSA were evaluated to determine if they met the initial DQOs of statistical performance goals as stated in Table 2-2, *Data Quality Objectives for the TEAD Environmental Risk Assessment*. The statistical performance goals were: confidence of 0.80 (i.e., alpha = 0.20); power of 0.90 (i.e., beta = 0.10); and a minimum detectable relative difference (MDRD) of 40 percent *(Guidance for Data Useability in Risk Assessments, USEPA, 1992c).* The software program Statgraphics Plus® (Manuguistics, Inc.) was used to evaluate the data.

The evaluation determines whether or not the data are sufficient to make precise estimates of population parameters. Precision by which a mean is estimated is determined by two factors: (1) population variability and (2) sample size.

Sixteen co-located soil samples were collected at the RSA, which was actually one more than originally planned. Variability was addressed by carefully selecting the sampling locations. The variability represents the naturally occurring variability in analyte concentrations in soil and the variability in soil types over large areas.

Table 4-11. Summary of Detection Limits-TBVs for Which Comparison Value Exceeded the TBV

Analyte	Receptor	Matrix
23478-PeCDF	Passerine Birds	rb[(a)], gw[(b)], sc[(c)], jr[(d)]
	Deer Mouse	rb, sc, gw
	Mule Deer	gw
	Jackrabbit	gw
	Kit Fox	jr
12378-PeCDD	Passerine Birds	rb, sc, jr
	Deer Mouse	rb, sc
	Kit Fox	jr, gh[(e)]
2378-TCDD	Kit Fox	jr
Aluminum	Deer Mouse	gw
Antimony	Deer Mouse	sc
	Kit Fox	jr
Cadmium	Passerine Birds	gh, rb, gw, sc, jr
Iron	Deer Mouse	rb, gw
	Kit Fox	jr
	Jackrabbit	gw
	Passerine Birds	gw, jr
Lead	Kit Fox	jr
	Bald Eagle	jr
	Golden Eagle	jr
	Passerine Birds	jr
Selenium	Deer Mouse	rb, sc, gw
	Kit Fox	jr
	Jackrabbit	rb, sc, gw
	Passerine Birds	gh, rb, gw, sc, jr
Zinc	Passerine Birds	jr
RDX	Jackrabbit	rb, sc, gw
	Mule Deer	rb, gw
	Deer Mouse	rb, sc, gw

Table 4-11. Summary of Detection Limits-TBVs for Which Comparison Value Exceeded the TBV (continued)

Analyte	Receptor	Matrix
2,4,6-TNT	Jackrabbit	rb, gw
	Mule Deer	rb, gw
	Deer Mouse	rb, gw
4,4-DDE	Passerine Birds	rb, gw
4,4-DDT	Passerine Birds	rb, gw
2,4-D	Kit Fox	jr, gh
	Jackrabbit	gw
	Deer Mouse	rb, sc, gw
Thallium	Deer Mouse	surface water, soil ingestion
	Passerine Birds	soil ingestion
	American Kestrel	soil ingestion
	Great Horned Owl	soil ingestion
	Golden Eagle	soil ingestion
	Bald Eagle	soil ingestion
	Mule Deer	soil ingestion
	Jackrabbit	soil ingestion
	Kit Fox	soil ingestion
Cadmium	Passerine Birds	soil ingestion

[a]Rabbitbrush.
[b]Gumweed.
[c]Sweetclover.
[d]Jackrabbit.
[e]Grasshoppers.

Power is defined as 1-beta (β), which is the probability of rejecting the null hypothesis (H_0) when the null hypothesis is false; high power equates to being able to detect a difference between the TEAD site soils and the RSA soils. It was assumed that variability would be similar between the RSA and TEAD, and that if a sample size of 16 was adequate at the RSA, then a sample size of 16 was adequate at TEAD.

An initial review of the RSA data was performed to determine if the statistical performance goals were met and whether sufficient samples were collected to adequately characterize the RSA. A value of 40 percent above the RSA mean for a particular analyte, which in most cases was below the upper bound concentration (UBC), was used as the MDRD, a suitable difference that the study would like to be able to detect between two samples.

The null hypothesis in the initial review of the RSA data was:

H_0: The true mean (of an analyte distribution) is equal to the RSA mean (of an analyte distribution).

(Equation 4-1)

$$\bar{x}_t = \bar{x}$$

where

$\bar{x}_t$ = *true mean*
$\bar{x}$ = *RSA mean*

The alternative hypothesis, H_A, was:

H_A: True mean (of an analyte distribution) is ≥ (greater than or equal to) 140% of the RSA mean.

(Equation 4-2)

$$\bar{x}_t \geq \bar{x} + 0.4\,\bar{x}$$

where

$\bar{x}_t$ = *true mean*
$\bar{x}$ = *RSA mean*

UBCs were calculated for the few organic analytes that were detected in the RSA. The determination of the UBC was consistent with the approach presented for the TEAD and RSA inorganic data. None of the organic analytes had detection frequencies greater than or equal to (GE) 85 percent; therefore, no statistical calculations were performed. The UBC was based upon the highest detected values in the "eco_value" column. Table 4-12 presents the summary

statistics and UBCs for detected organic analytes at the RSA. Table 4-13 presents the UBCs for both the inorganic and organic RSA data.

At the RSA, the inorganic analytes exhibited normal, log-normal, and special case distributions (Table 5-42 in Section 5.12). The TEAD background data exhibited similar distributions (Table 2-3). Log normal data were transformed by taking the natural log of the value prior to analysis. Special case data were not transformed, although this increases the uncertainty in the data analysis.

The RSA data listed in Table 4-12 included unconfirmed detections for aldrin, endosulfan sulfate, endosulfan II, endrin aldehyde, and endrin ketone. These data are uncertain. The octachlorodibenzodioxin-nonspecific (OCDD) detect was not associated with laboratory contamination. Other organics were not flagged: fluoranthene (FANT), 2-methylnaphthalene (2MNAP), benzo(ghi)perylene (BGHIPY), di-ethyl phthalate (DEP), phenanthrene (PHANTR), and pyrene (PYR). It is likely that organics do occur in the RSA; however, this is because confirmed detections of p,p'-DDT, dieldrin, di-n-butyl phthalate (DNBP, a possible lab contaminant), and octachlorodibenzodioxin(OCDD) occurred. These data are discussed more fully in Section 5.10.

Table 4-14 reports all of the COPCs that occurred at the RSA. The second column indicates the sample size required to provide power of 90 percent (column 1) with alpha fixed at 0.2. For 11 COPCs in bold text (arsenic, beryllium, benzo(ghi)perylene, cobalt, copper, di-n-butylphthalate, endrin ketone, fluoranthene, 2-methylnaphthalene, mercury, and nickel), the sample size of 16 was adequate to make precise estimates of the population mean given the data available, and the DQOs were met. As mentioned above, endrin ketone was flagged with a "U" flag code (unconfirmed).

However, for the remaining 18 COPCs, the sample size was not adequate or the data were not normally distributed. The *inorganic* analytes for which the sample size was inadequate or the data were not normal are indicated with an asterisk (*) following the chemical name; these *inorganics*, in all cases, were from distributions that were neither normal nor log-normal (i.e., special case) and, therefore, the estimates of sample size for these analytes are not valid. In order to evaluate the statistical performance goal of required sample size, the statistical software assumes either an underlying normal or lognormal distribution. Parametric statistics are not applicable to analytes with a non-normal distribution (e.g., "special case," less than 85 percent detects, or no detections) or to a distribution that cannot be transformed such that normality is approximated.

Where the predicted required sample size exceeds 16 (Table 4-14), the true mean cannot be identified for the RSA data within the MDRD specified with parametric statistical methods available.

Table 4-12. Summary of RSA Organic Data Upper Bound Concentrations (UBCs)

Analyte	Analyte Code	No. of Samples	No. of Detects	DF[a] (%)	Flags [b]	UBC [c]
Aldrin	ALDRN	16	6	37.5	All Us	0.0103
Endosulfan II	BENSLF	16	7	43.75	6 Us, 1 C	0.00581
Benzo(ghi)perylene	BGHIPY	16	1	6.25	No flag	0.35
p,p'-DDT	PPDDT	16	2	12.5	2 Cs	0.00667
Diethyl phthalate	DEP	16	3	18.75	No flag	5.8
Dieldrin	DLDRN	16	1	6.25	1 C	0.0038
Di-n-butyl phthalate	DNBP	16	1	6.25	1 C	1.6
Endrin aldehyde	ENDRNA	16	1	6.25	1 UZ	0.00193
Endrin ketone	ENDRNK	16	1	6.25	1 UZ	0.000811
Endosulfan sulfate	ESFSO4	16	4	25	4 UZ	0.00143
Fluoranthene	FANT	16	1	6.25	No flag	0.057
2-Methylnaphthalene	2MNAP	16	1	6.25	No flag	0.029
Octachlorodibenzo-dioxin	OCDD	16	1	6.25	No flag	0.00126
Phenanthrene	PHANTR	16	1	6.25	No flag	0.12
Pyrene	PYR	16	2	12.5	No flags	0.23

Note.—No normality tests, no statistics; all DFs were <85%.

[a]Detection frequency.

[b]No data had data qualifier codes; U=unconfirmed analysis; C=analysis confirmed; Z=non-target compound analyzed for and detected.

[c]Upper bound concentration. All units in μg/g, equivalent to ppm.

Table 4-13. Selected Reference Study Area (RSA) Upper Bound Concentrations (UBCs) for Inorganic and Organic Analytes

Analyte	RSA UBC
Aldrin	0.0103
Aluminum	17,300
Arsenic	8.86
Barium	134
Endosulfan II	0.00581
Beryllium	0.82
Benzo(ghi)perylene	0.35
Chromium	22.6
Cobalt	7.99
Copper	17.24
p,p'-DDT	0.00667
Di-ethyl-phthalate	5.8
Dieldrin	0.0038
Di-n-butyl-phthalate	1.6
Endrin aldehyde	0.00193
Endrin ketone	0.000811
Endosulfan sulfate	0.00143
Fluoranthene	0.057
Iron	17,400
Lead	73.3
2-Methylnaphthalene	0.029
Manganese	499
Mercury	0.07
Nickel	14.8
Octachlorodibenzodioxin	0.00126
Phenanthrene	0.12
Pyrene	0.23
Vanadium	24.3
Zinc	127

Note.—All UBC values are in $\mu g/g$, micrograms/gram, ppm.

Table 4-14. Sample Size Required to Meet Statistical Performance Goals for the RSA Soil Data

	Alpha=0.2; Beta fixed		Alpha=0.2; Beta floating				
Analyte	Beta	N[a]	Beta	N	H_o[b]	H_A[c]	UBC[d]
Aldrin	0.1	52	0.439	16	0.00258	0.0036	0.0103
Aluminum*	0.1	NA[e]	NA	16	NA	NA	17,300
Arsenic	0.1	**5**	NA	NA	7.24	10.16	8.86
Barium*	0.1	NA	NA	16	NA	NA	134
Endosulfan II	0.1	71	0.5196	16	0.001033	0.001446	0.00581
Beryllium	0.1	**6**	NA	NA	0.5248	0.7347	0.82
Benzo (ghi)-perylene	0.1	**16**	NA	NA	0.10625	0.14875	0.35
Chromium*	0.1	NA	NA	16	NA	NA	22.6
Cobalt	0.1	**2**	NA	NA	5.2475	7.3465	7.99
Copper	0.1	**10**	NA	NA	13.83	19.362	17.24
p,p'-DDT	0.1	20	0.1425	16	0.00236	0.0033	0.00667
Diethyl phthalate	0.1	245	0.7081	16	0.59125	0.82775	5.8
Dieldrin	0.1	24	0.2043	16	0.0009875	0.0013825	0.0038
Di-n-butyl phthalate	0.1	**5**	NA	NA	0.7094	0.9931	1.6
Endrin aldehyde	0.1	58	0.4675	16	0.000355	0.000497	0.00193
Endrin ketone	0.1	**10**	NA	NA	0.000285	0.000399	0.000811
Endosulfan sulfate	0.1	31	0.2783	16	0.00046	0.00064	0.00143
Fluoranthene	0.1	**13**	NA	NA	0.01856	0.02598	0.057
Iron*	0.1	NA	NA	16	NA	NA	17,400
Lead*	0.1	NA	NA	16	NA	NA	73.3
2-Methyl naphthalene	0.1	**2**	NA	NA	0.0168	0.0235	0.029
Manganese*	0.1	NA	NA	16	NA	NA	499
Mercury	0.1	**6**	NA	NA	0.030119	0.0431662	0.07
Nickel	0.1	**11**	NA	NA	7.918	11.085	14.8
Octachlorodi-benzodioxin (nonspecific)	0.1	229	0.7018	16	0.000166	0.000233	0.00126
Phenanthrene	0.1	55	0.4551	16	0.0225	0.0315	0.12
Pyrene	0.1	37	0.3385	16	0.063	0.0882	0.23
Vanadium*	0.1	NA	NA	16	NA	NA	24.3
Zinc*	0.1	NA	NA	16	NA	NA	127

Note.— Bold text indicates an adequate sample size.
[a]N=sample size. [b]H_o: $\bar{x}_t = \bar{x}$ (See Section 4.5.3.2)
[c]H_A: $\bar{x}_t = \bar{x} + 0.4\bar{x}$
[d]UBC=Upper bound concentration.
[e]NA=Not applicable; statistical evaluation assumes normal distribution.
* Indicates distribution was not normal or lognormal based upon the UCL95.

The data for TEAD were combined by SWMU and evaluated against the RSA data by comparing to the UBC. This was considered preferable to using the methods described above for the RSA data because so many of the data failed to meet the requirements for normality. According to Gilbert (1987), many environmental analyte populations do not exhibit normality but are typically lognormal or have other types of distribution.

4.5.3.3 *Surface Water Data Usability*

Limited surface water data were collected by various subcontractors. Surface water and sediment data were collected from several areas within SWMU 14. The surface water and sediment data for SWMU 14 were not evaluated statistically because of the low frequency of detection for all analytes measured. Most of the surface water data available for the TEAD site were included in the quantitative exposure analysis because of the small sample sizes available.

4.5.3.4 *Biometric Data Usability*

Biometric data (i.e., abundance, occurrence) were collected from quantitative surveys. These data were not subjected to rigorous statistical analysis because the sampling design was initiated to merely discern data trends. A rigorous design would include multiple seasons, as well as multiple locations within the RSA as well as the ESAs.

4.5.3.5 *Biota Analytical Data Usability*

The biota data were collected according to the sampling and analysis plan identified in the SWEAP/QAPjP and were the output of the DQO process. The types and numbers of samples collected reflected a compromise based upon budget, time constraints, and consideration of biota populations, and were agreed upon by the ETAG. A statistical evaluation of the biota data, as performed on the soil data above in Section 4.5.3.2, would not be appropriate since the likelihood of a normal or lognormal distribution is low. This would be expected because of the biased nature of the sample selection and the limited number of samples. The DQO guidance was applied whenever possible and appropriate, but its application is directed towards the characterization of nature and extent of soil and water contamination. All of the biota data with the few exceptions noted in Section 4.5.2.3.1, however, were used in the risk assessment. The biota laboratories, in every case where sufficient sample material remained, re-extracted and/or re-analyzed any sample that did not meet analytical method criteria.

The elevated levels of lead in jackrabbit tissue at both the ESA SWMUs and the RSA presented a minor confounder to the data usability for the risk assessment. However, the data were used as supplied by the laboratory, and accepted by the data validators, and

were subsequently found acceptable for the risk assessment purposes. The implications of these data on the risk assessment are discussed in further detail in Section 7.6.4.

4.5.4 Observed Data Trends and Implications on the Risk Assessment

The soil and biota sample data qualifiers are summarized in Tables 4-15 and 4-16. Details of the data qualifiers for each sample are provided in the previous Section 4.5.2.3.1, and the external DQAs are located in Appendices G and H. As can be seen from these tables, the vast majority of both sets of sample data were considered acceptable for risk assessment purposes. The USAEC performance-demonstrated methods utilize "flag codes" to indicate the *type* of data record; data qualifiers are associated with the data *quality* for each data record. Following the laboratory level DQA, *external* data qualifiers and data qualifier codes, according to the CLP data validation guidelines, were applied by the data validators to both data sets. Detailed explanations of the USAEC flag codes and qualifiers, and the CLP data qualifiers and codes are presented in Appendices D and E.

4.5.4.1 *Soil Sample Summary*

As shown in Table 4-15, most of the data records in the soil sample set were "less thans" (LTs) or non-detects (NDs). All of the laboratory flag codes were considered acceptable. The laboratory placed very few qualifiers associated with estimated or possibly questionable data. The notable qualifiers were as follows:

- RSA Metals—A total of 17 data records received "I" laboratory qualifiers (i.e., low-spike recovery high), 4 percent of analyte group total; one record was laboratory qualified as "J" (i.e., low-spike recovery low), 0.3 percent of analyte group total.

- ESA SWMUs Explosives—A total of 20 data records received laboratory "I" qualifiers (6 percent of analyte group total).

- ESA SWMUs Metals—One record received an "I" laboratory qualifier (0.1 percent of analyte group total); one record received a laboratory "J" qualifier (0.1 percent of analyte group total).

- ESA SWMUs Pesticides/PCBs—Eight records were laboratory qualified as "N" (i.e., high-spike recovery low), 0.7 percent of analyte group total.

An "I" laboratory qualifier (low-spike recovery high) could indicate that sample results associated with that lot might be biased high. A "J" laboratory qualifier (low-spike recovery low) may be associated with low sample values for that lot. These two qualifiers would most likely affect samples with very low concentrations or non-detects. An "N" qualifier (high-spike recovery low) may result in samples with generally higher analyte concentrations being underestimated (i.e., biased low) on a lot basis.

Table 4-15. Summary of Soil Sample Data Quality Assessment Qualifiers (RSA and ESA SWMUs)

Location	Total No. of Data Records in Data Set	Analyte Group	Matrix	No. of Records in Analyte Group	Laboratory Flag Code	Number of Sample Records with Laboratory Flag Codes	Laboratory Data Qualifer	Number of Sample Records with Laboratory Data Qualifiers	No. of Laboratory Data Qualifiers (% of total records in analyte group) *	External DQA Qualifier	Number of Sample Records with External DQA Qualifier Codes	No. of External DQA Qualifiers (% of total records in analyte group) **
RSA	3630	Cyanide all nondetects	Soil	17	Blank (no Qualifier)	16	Blank (no Qualifier)	17	--	Blank (no Qualifier)	17	--
					D (duplicate analysis)	1	none	--	--	none	--	--
RSA	3630	Dioxins/furans 1 detect	Soil	289	Blank (no Qualifier)	272	Blank (no Qualifier)	289	--	Blank (no Qualifier)	283	--
					D (duplicate analysis)	17	none	--	--	J	1	0.3% (a)
					none	--	none	--	--	UJ	5	2%
RSA	3630	Explosives all nondetects	Soil	153	Blank (no Qualifier)	144	Blank (no Qualifier)	153	--	Blank (no Qualifier)	153	--
					D (duplicate analysis)	9	none	--	--	none	--	--
RSA	3630	Metals 284 detects	Soil	391	Blank (no Qualifier)	368	Blank (no Qualifier)	373	--	Blank (no Qualifier)	391	--
					D (duplicate analysis)	23	I	17	4%	none	--	--
							J	1	0.3%	none	--	--
RSA	3630	Pesticides/PCBs 485 nondetects	Soil	510	Blank (no Qualifier)	304	Blank (no Qualifier)	510	--	Blank (no Qualifier)	510	--
					D (duplicate analysis)	18	none	--	--	none	--	--
					C	4	none	--	--	none	--	--
					T	154	none	--	--	none	--	--
					TD	9	none	--	--	none	--	--
					U	12	none	--	--	none	--	--
					UD	2	none	--	--	none	--	--
					ZU	6	none	--	--	none	--	--
					ZUD	1	none	--	--	none	--	--
RSA	3630	SVOCs 2013 nondetects	Soil	2270	Blank (no Qualifier)	1664	Blank (no Qualifier)	2270	--	Blank (no Qualifier)	2270	--
					D (duplicate analysis)	115	none	--	--	none	--	--
					DR	15	none	--	--	none	--	--
					DS	21	none	--	--	none	--	--
					R	240	none	--	--	none	--	--
					S	215	none	--	--	none	--	--
ESA SWMUs	7960	Cyanide 6 detects	Soil	40	Blank (no Qualifier)	30	Blank (no Qualifier)	40	--	Blank (no Qualifier)	40	--
					D (duplicate analysis)	10	none	--	--	none	--	--
ESA SWMUs	7960	Dioxins 49 detects	Soil	680	Blank (no Qualifier)	510	Blank (no Qualifier)	680	--	Blank (no Qualifier)	680	
					D (duplicate analysis)	170	none	--	--	none	--	--
ESA SWMUs	7960	Explosives 1 detect	Soil	360	Blank (no Qualifier)	238	Blank (no Qualifier)	340	--	Blank (no Qualifier)	360	
					D (duplicate analysis)	81	I	20	6%	none	--	--
					C	1	none	--	--	none	--	--
					H	39	none	--	--	none	--	--
					HD	1	none	--	--	none	--	--
ESA SWMUs	7960	SVOCs 100 detects	Soil	4760	Blank (no Qualifier)	3120	Blank (no Qualifier)	4760	--	Blank (no Qualifier)	4720	--
					D (duplicate analysis)	1040	none	--	--	none	--	--
					DR	92	none	--	--	none	--	--
					R	450	none	--	--	R	24	0.5%
					RD	58	none	--	--	UJ	16	0.3%
ESA SWMUs	7960	Metals 706 detects	Soil	920	Blank (no Qualifier)	690	Blank (no Qualifier)	918		Blank (no Qualifier)	896	
					D (duplicate analysis)	230	none	--		none	--	
							I	1	0.1%	none	--	
							J	1	0.1%	none	--	
									--	J	12	0.1%
									--	R	3	0.3 % (b)
									--	UJ	9	1%
ESA SWMUs	7960	Pesticides/PCBs 70 detects	Soil	1200	Blank (no Qualifier)	548	Blank (no Qualifier)	1192		Blank (no Qualifier)	1200	--
					D (duplicate analysis)	186	N	8	0.7%	none	--	--
					C	26	none	--		none	--	--
					CD	6	none	--		none	--	--
					D7	4	none	--		none	--	--
					T	285	none	--		none	--	--
					TD	94	none	--		none	--	--
					U	10	none	--		none	--	--

Table 4-15. Summary of Soil Sample Data Quality Assessment Qualifiers (RSA and ESA SWMUs) (continued)

Location	Total No. of Data Records in Data Set	Analyte Group	Matrix	No. of Records in Analyte Group	Laboratory Flag Code	Number of Sample Records with Laboratory Flag Codes	Laboratory Data Qualifer	Number of Sample Records with Laboratory Data Qualifiers	No. of Laboratory Data Qualifiers (% of total records in analyte group) *	External DQA Qualifier	Number of Sample Records with External DQA Qualifier Codes	No. of External DQA Qualifiers (% of total records in analyte group) **
ESA SWMUs (cont'd.)	7960	Pesticides/PCBs	Soil	1200	U7	2	none	--		none	--	--
					U7D	1	none	--		none	--	--
					UD	3	none	--		none	--	--
					ZC	8	none	--		none	--	--
					ZCD	4	none	--		none	--	--
					ZU	7	none	--		none	--	--
					ZUD	2	none	--		none	--	--
					7	14	none	--		none	--	--

Note—. All laboratory flag codes are considered acceptable.
Note—. Bold values are discussed in accompanying text.
* = Only laboratory data qualifiers associated with questionable data quality are: I, J, N
** = Only external data qualifiers associated with questionable data quality are: U, J, UJ, R
[a]—. All less thans (LTs); 2 were duplicates.
[b]—. Two were duplicates.

Table 4-16. Summary of Biota Sample Data Quality Assessment Qualifiers (RSA, ESA SWMUs)

Analyte Group	Matrix	No. of Records in Analyte Group	Laboratory and DQA Qualifiers	Number of Sample Records with Laboratory Qualifiers	Number of Sample Records with External DQA Qualifiers	Number of Sample Records with External DQA Qualifier Codes	No. of External DQA Qualifiers (% of total records)	% Blanks (detects)	% U Laboratory Qualifiers (nondetects)	% B Laboratory Qualifiers **	% UB Laboratory Qualifiers ***
Dioxins/furans	V (a), JR(b)	3175	Blank (no qualifier)	586	3017	3017	5%	18%	76%	4%	2%
			U	2400	66						
			J	0	22						
			UJ	0	70						
			B	117							
			UB	50							
			BPR	1							
			E	4							
			PR	1							
			Q	10							
			UE	2							
			UQ	4							
			19			83					
			5B			8					
			5B,19			1					
			7			66					
Dioxins/furans	INV(c)	793	Blank (no qualifier)	73	722	722	9%	9%	83%	3%	2%
			U	659	19						
			J	0	5						
			UJ	0	47						
			B	23							
			UB	19							
			UBQ	2							
			BQ	2							
			Q	12							
			UQ	3							
			19			506					
			7			268					
			7,19			4					
Metals	V, JR	2286	Blank (no qualifier)	1059	1767	1767	23%	46%	32%	22%	0%
			U	725	122						
			J		144						
			UJ		253						
			B	502							
			7			124					
			8			146					
			9			30					
			15			145					
			21			145					
			8,15			39					
			8,9			15					
			8,8,15			2					
			9,15			13					
Metals	INV	666	Blank (no qualifier)	295	600	600	10%	44%	26%	30%	0%
			U	171	4						
			J		37						
			UJ		25						
			B	200							
			7			4					
			8								
			9								
			15			62					
			21								
			8,15								
			8,9								
			8,9,15								
			9,15								

Table 4-16. *Summary of Biota Sample Data Quality Assessment Qualifiers (RSA, ESA SWMUs) (continued)*

Analyte Group	Matrix	No. of Records In Analyte Group	Laboratory and DQA Qualifiers	Number of Sample Records with Laboratory Qualifiers	Number of Sample Records with External DQA Qualifiers	Number of Sample Records with External DQA Qualifier Codes	No. of External DQA Qualifiers (% of total records)	% Blanks (detects)	% U Laboratory Qualifiers (nondetects)	% B Laboratory Qualifiers **	% UB Laboratory Qualifiers ***
DDT, DDE	V, JR	254	Blank (no qualifier)	16	243	243	4%	6%	94%	0%	0%
			U	238							
			J	0	11						
			UJ								
			14			11					
DDT, DDE	INV	70	Blank (no qualifier)	19	41	41	41%	27%	73%	0%	0%
			U	51	0						
			J		19						
			UJ		10						
			10			7					
			10,14			2					
			14			10					
			14,10			7					
			5b, 14, 10			3					
2,4-D	V, JR	127	Blank (no qualifier)	3	125	125	2%	2%	98%	0%	0%
			U	124	0						
			J	0	2						
			UJ								
			14			2					
RDX, TNT	V	194	Blank (no qualifier)	19	72	72	63%	10%	90%	0%	0%
			U	175							
			J		12						
			UJ		110						
			10			58					
			13			12					
			8,10			52					
PAHs	V, JR	762	Blank (no qualifier)	322	656	656	14%	42%	55%	3%	0%
			B	22	0						
			U	418	22						
			J		78						
			UJ		6						
			13			9					
			14			6					
			5b			32					
			7			59					

**—. For metals only: B qualifier indicates that value was above the MDL but below the CRDL; in absence of any additional data qualifiers, value is considered a valid detect.
***—. UB is considered a non-detect due to blank contamination.
aV=Vegetation.
bJR=Jackrabbit.
cINV=Invertebrates.

External data qualifiers, of which there were very few, were assigned by EcoChem. The notable exceptions were as follows:

- RSA Dioxins—One record received a "J" qualifier (i.e., value is estimated), 0.3 percent of analyte group total; 5 records received "UJ" qualifiers (i.e., material was analyzed for but not detected; the sample quantitation limit is estimated), 2 percent of analyte group total.

- ESA SWMUs SVOCs—A total of 24 records received "R" qualifiers (i.e., rejected), 0.5 percent of analyte group total; 16 records received "UJ" qualifiers (0.3 percent of analyte group total).

- ESA SWMUs Metals—A total of 12 records were "J" qualified (0.1 percent of analyte group total), 3 records were "R" qualified (0.3 percent of analyte group total); 9 records were "UJ" qualified (1 percent of analyte group total).

Data estimated as either "J", or "UJ" may result in either low or high bias on analytical results; however, the contribution of these data qualifiers on the entire soil data set is negligible. As a general rule, SVOC and explosives analyses result in more data qualifiers due to the difficulties associated with those analytical methods.

No significant data quality trends were observed. Data collected from more than one sampling event by more than one contractor, and analyzed by multiple laboratories, could show different types of trends. However, the co-located soil sample data set was collected in a one-time sampling event and analyzed by two laboratories in a short period of time. The number of data records that were rejected was very low, which results in a negligible impact on data useability for the risk assessment.

In general, the RSA COPC values were lower than the corresponding ESA SWMU values. This would lend confidence to the assumptions that (1) the RSA was generally uncontaminated relative to TEAD, and (2) that the RSA was an acceptable location for a reference site. This evaluation also serves to strengthen the risk assessment conclusions.

4.5.4.2 *Biota Sample Summary*

As summarized in Table 4-16, the laboratory and data validators placed very few qualifiers associated with estimated or possibly questionable data. A "B" laboratory or external data validation qualifier indicates possible blank contamination for organic analyses. For the metals, however, a "B" laboratory qualifier indicates that the value is above the MDL but below the CRDL. Those metal qualifiers were ignored and simply treated as detects for this project since the method-matrix-specific MDL was used for all biota analyses. "U" qualifiers under CLP indicate that the analyte is not detected and does not reflect data quality. No data were qualified as "R" or rejected since the biota laboratories re-extracted

or reanalyzed any samples that failed initial analysis. The notable qualifiers were as follows:

- Dioxins/furans (vegetation and jackrabbit tissue)—Only 5 percent of the data records received any type of external data qualifier. The laboratory placed 117 "B" qualifiers on that same data which constituted only 5 percent of the data. A total of 2 percent of the data received "UB" qualifiers, also non-detects based on blank contribution. The vast majority of the data were nondetects (approximately 76 percent) and detects (approximately 18 percent).

- Dioxins/furans (invertebrate tissue)—Only 9 percent of the data records received any type of external data qualifier. Of the invertebrate data set, 83 percent were nondetects, 9 percent detects,and 3 percent of the records were associated with blank contamination.

- Metals (vegetation and jackrabbit tissue)—Some 23 percent of the records received some type of external data qualifier; approximately 46 percent were detects with no "B" qualifier, and approximately 32 percent were non-detects. "B" qualifiers were not indicative of questionable data quality or blank contamination.

- Metals (invertebrate tissue)—A total of 44 percent of the data records were detects with no "B" qualifier, 26 percent non-detects, and only 10 percent of the data set received external data qualifiers as "J" or "UJ".

- DDE and DDT (vegetation and jackrabbit tissue)—Only 6 percent of the data were detects, and 94 percent were nondetects. While 4 percent of the data records received external data qualifiers of "J" or "UJ". No qualifiers associated with blank contamination were assigned.

- DDE and DDT (invertebrate tissue)—A total of 73 percent of the data records were non-detects, and 27 percent were detects. A higher percentage (41 percent) of the data records received either a "J" or "UJ" external data qualifier. The invertebrate samples showed higher numbers of detects of DDE and DDT than the other biotic matrices.

- 2,4-D (vegetation and jackrabbit tissue)—Only 2 percent of the data records received external data qualifers of J. A total of 98 percent of the data were nondetects.

- RDX/2,4,6-TNT (vegetation)—As expected, this analyte group had the largest number of external data qualifiers (63 percent) due to the matrix interferences from gumweed and rabbitbrush. These interferences resulted in elevated MDLs for these two vegetation types. However, most of the data were non-detects (90 percent), and blank contamination was not an issue. Most of the external data qualifers were "UJs".

- PAHs (vegetation and jackrabbit tissue)—Only 14 percent of the data records received external data qualifiers ("U"). Over half (55 percent) of the records were non-detects,

and 42 percent were detects. Blank contribution was approximately 3 percent, and was determined by the laboratory.

Although the biota sample set received more qualifiers in general than the soil data set, this was to be expected since the CLP guidelines for data review were not developed for biota analyses. Furthermore, all of the biota underwent external DQA as compared to approximately 15 percent of the soil data. In view of the more difficult and non-standard biota analyses, the great majority of qualifiers were not associated with questionable data quality, but rather with non-detects. No significant data quality trends other than the elevated MDLs for explosives in gumweed and rabbitbrush were noted. High MDLs in these cases could either underestimate the sample values (i.e., false negatives) or overestimate the sample values (false positives).

Large numbers of data records that are associated with non-detects can lead to risk assessment uncertainties in the form of potential false negatives. However, the incorporation of non-detects at one-half the detection limit should reduce this uncertainty, and be conservative in the risk assessment approach. The uncertainty associated with non-detects was also reduced by proper selection of analytical methods, adherence to stringent QA/QC requirements, and the development of analyte-matrix-specific MDLs for biota.

5.0 RESULTS OF CO-LOCATED SOIL AND BIOTA CHEMICAL ANALYSIS

The results of the Fall 1994/1995 field sampling effort are presented in this section. Collection and analysis of grasshoppers and beetles took place in the Fall of 1995. As discussed earlier in Section 3.3.3, the surface soil and vegetation sample locations were selected from previously identified areas of contamination at TEAD. The samples were then collected from a nominal depth of 6 inches and analyzed for the range of COPCs or analyte groups identified for selected TEAD SWMUs. In addition, collection of surface soil samples in the RSA provided data for a comparison of analyte levels in soils from a presumed uncontaminated background area to levels present in soils from contaminated SWMUs at TEAD. The RSA data were also used to compare soil analyte levels to those established as representing background levels within the TEAD facility boundary as discussed in Section 2.2.1.

The following discussions, figures, and tables provide summaries of only those analytes detected in soil and biota. A complete listing of analytical results is provided in Appendix D (Co-located Soil Sampling Results and Internal DQA) and Appendix E (Biota Sampling Results and Internal DQA). Included with each appendix is a guide to IRDMIS flag codes and data qualifiers (Appendix D) and biota laboratory and CLP qualifiers (Appendix E). In order to simplify the interpretation of results, soil data concentrations in the following text and tables are reported in micrograms per gram (μg/g) or parts per million (ppm) with the exception of dioxins/furans and pesticides/PCBs that are in the parts per billion (ppb) range of concentrations. Biota analytical results are expressed in milligrams per kilogram (mg/kg), ppm (metals); nanograms per kilogram (ng/kg), parts per trillion (ppt) (dioxins/furans); and μg/kg, parts per billion (organics).

<u>**Biota Sample Data**</u>

For the biota data, the assignment of laboratory qualifiers is based upon the CLP statements of work for inorganic and organic analyses. Although the statements of work are written for soil and water analyses, the biota laboratories were instructed to use CLP qualifiers wherever appropriate, and to document instances in the case narratives where the use of a qualifier may or may not be appropriate.

The assignment of external data quality assessment qualifiers by EcoChem was based on the *Functional Guidelines* for organic and inorganic data review (USEPA 1994 a and b), but was slightly modified because of the less well defined nature of biota analyses, which are not addressed explicitly under that guidance.

The CLP program requires the laboratory to place a "B" qualifier on inorganics (metals) when the detected value is less than the CRDL but greater than the instrument detection limit (IDL). In the case of the biota analyses, the CRDL was essentially the MDL obtained from the MDL studies. For organic analyses, a "B" qualifier is assigned by the laboratory where method blank contamination reduces the reliability of the sample data for that SDG. TLI has its own set of qualifiers which are used expressly with USEPA Method 8290, "Dioxins and Furans by

High Resolution Gas Chromatography-Mass Spectrometry."

The biota database was filtered to obtain a list of all HES/TLI laboratory data qualifiers. The list of chemical classes and their respective qualifiers are as follows:

- Dioxins: B, BPR, E, PR, Q, QE, U, UB, UE, UQ, V

- Explosives: U

- Herbicides: U

- Metals: B, U

- Pesticides: U

- PAHs: B, U

Accordingly, an approach was developed in order to obtain a list of *detected* analytes in the biota tissue where assignment of laboratory and data validation qualifiers did not parallel soil and water analyses. The biota database was evaluated on the field containing the laboratory qualifier, "QUAL" such that:

- If "B" qualifier *and* analyte is a metal, *include* in list of detects
- If "B" qualifier *and* analyte is an organic, *and* Ecochem attached a CLP "U" laboratory qualifier, exclude from list of detects (laboratory contamination)
- If "E" qualifier, exclude from list of detects
- If "PR" qualifier, exclude from list of detects
- If "Q" qualifier, exclude from list of detects
- If "U" qualifier, exclude from list of detects
- If "V" qualifier, *include* in list of detects
- If no qualifier, *include* in list of detects
- If "R" qualifier, exclude from list of detects and from quantitative risk assessment

The assignment of CLP data validation qualifiers under the *Functional Guidelines* was not the determining factor in identifying a true detect in the biota data. However, the data qualifiers and case narratives for the analytical data were reviewed for accuracy, consistency, and completeness, and evaluated against the PARCC parameters. In the absence of external data review, which is often the case due to budget constraints, analytical data as reported by the laboratory are judged satisfactory if the analyses were performed according to the method and if all QA/QC requirements and deliverables are met.

Soil Sample Data

Soil samples were collected from a nominal depth of 6 inches and analyzed for COPCs as identified in Sections 2.2.2. and 4.0. Analytical values were compared to TEAD background

UBCs, which were determined as discussed in Section 2.1.1. Values were also compared to RSA data to compare analyte levels in soils from a presumed uncontaminated reference area to levels in soils from contaminated SWMUs at TEAD. To establish a level of confidence in the RSA data, statistical comparisons of this data set against the TEAD background set were made as discussed in Section 5.14. For most metals compared in the two data sets, there were no statistically significant differences between the two data sets, leading to the conclusion that the RSA can be considered representative of the study background. Similarly, as part of the DQO evaluation in Section 4.5.3, RSA data were evaluated for statistical sample size.

To facilitate review of the analytical results presented in the following SWMU-by-SWMU sections, Table 5-1 provides a comparison of the statistically derived UBCs for both the TEAD background and RSA soil data sets. Note that neither background nor RSA UBC values were subtracted from SWMU values but are provided for comparison purposes only. For the *biota* result tables, TEAD and RSA *Cterms* are provided for comparison purposes only. Cterms were used for biota since UBCs refer strictly to background soil data. RSA Cterm values shown in the *biota* detect tables are taken for comparison from Appendix I.

Table 5-1. TEAD Background and RSA Upper Bound Concentrations for Soil

Analyte	TEAD[a] UBC[b]	RSA[c] UBC
Silver (Ag)	0.66	0.80
Aluminum (Al)	28,083	17,300
Arsenic (As)	11.7	8.86
Barium (Ba)	247	134
Beryllium (Be)	1.46	0.82
Calcium (Ca)	114,483	35,548
Cadmium (Cd)	0.847	1.20
Cobalt (Co)	6.94	7.99
Chromium (Cr)	20.6	22.6
Copper (Cu)	24.7	17.24
Cyanide	5	0.25
Iron (Fe)	22,731	17,400
Mercury (Hg)	0.057	0.07
Potassium (K)	5,449	3,259
Magnesium (Mg)	7,061	6,311
Manganese (Mn)	698	499
Sodium (Na)	337	282
Nickel (Ni)	17.9	14.8
Lead (Pb)	18.2	73.3
Antimony (Sb)	15	1.00
Selenium (Se)	0.449	0.449
Thallium (Tl)	11.7	34.3
Vanadium (V)	28.4	24.3
Zinc (Zn)	103	127

Note.—Units of measurement are in micrograms per gram (μg/g), ppm.

[a]Tooele Army Depot.

[b]Upper bound concentration . Note–. Refer to Section 2.2.1.2 for TEAD UBC calculation. RSA UBCs were calculated in a similar manner however duplicates were not averaged; only the primary sample value was used.

[c]Reference study area.

A summary of the co-located soil and vegetation samples collected—including the number and type of vegetation collected in each sampling area and a table providing detailed information regarding the collection of blacktailed jackrabbits at ESA-1 and the RSA—may be found in Appendix C. No *field* duplicates or *field* QC samples were collected for the biota samples; biota duplicates and biota MS/MSDs were prepared by the laboratories and analyzed as part of the biota analyses, except for the grasshopper and beetle samples due to a lack of sufficient sample material. However, method blanks and laboratory control samples were prepared and analyzed with all biota samples.

Site-specific figures are included that show each of the sampling locations by media from the Fall 1994 and 1995 investigations (Figures 5-1 through 5-9).

5.1 SWMU 42 - BOMB WASHOUT BUILDING

5.1.1 Soil Sample Results

A total of nine surface soil samples (ES1-94-01 through ES1-94-09) were collected at SWMU 42 from selected locations of contamination previously identified by RFI investigations (Figure 5-1). These samples were collected primarily within an open ditch and ponding area that received discharge of wastewater from bomb washout operations. A duplicate of sample ES1-94-02 was also collected. The samples were analyzed for inorganics, dioxins/furans, pesticides/PCBs, explosives, and SVOCs. The following summarizes the results of co-located soil sample analyses at SWMU 42. Results are presented in Table 5-2.

Inorganics

Numerous metals were found to exceed the RSA and/or TEAD calculated UBCs. Arsenic, antimony, barium, cadmium, cobalt, copper, mercury, and lead were the primary metals exceeding UBCs. Sample ES1-94-09, located within the ponding area, contained the highest concentrations of metals including antimony (352 μg/g), arsenic (27μg/g), barium (623 μg/g), copper (133 μg/g), and lead (822 μg/g). Lead was found to exceed both UBCs in eight of nine samples from SWMU 42; antimony, arsenic, and cadmium exceeded both UBCs in seven of the nine samples; and barium exceeded UBCs in six samples.

The metals results for the co-located soil samples correspond to previous RFI results reported for SWMU 42. However, maximum concentrations of metals in the ditch and ponding area from the previous RFI were much higher (e.g., lead up to 40,000 μg/g) than those detected in the fall 1994 sampling effort.

Dioxins/Furans

Two samples (ES1-94-06 and ES1-94-09), in addition to elevated metals, contained detectable concentrations of 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin at 0.06 ppb and 0.53 ppb, respectively. In addition, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) was detected at 0.01

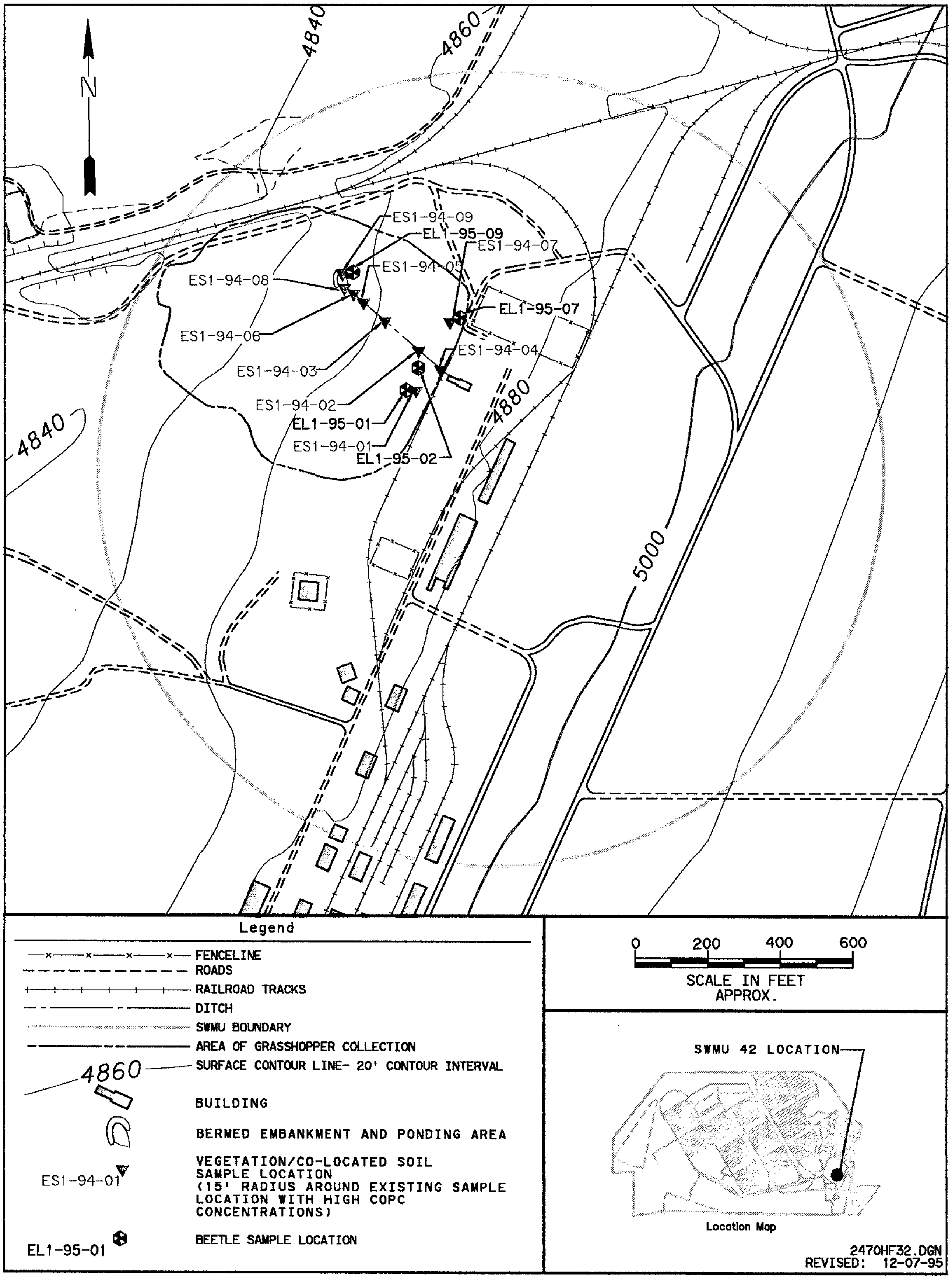

Figure 5-1. Sample Locations for the Bomb Washout Building (SWMU 42)

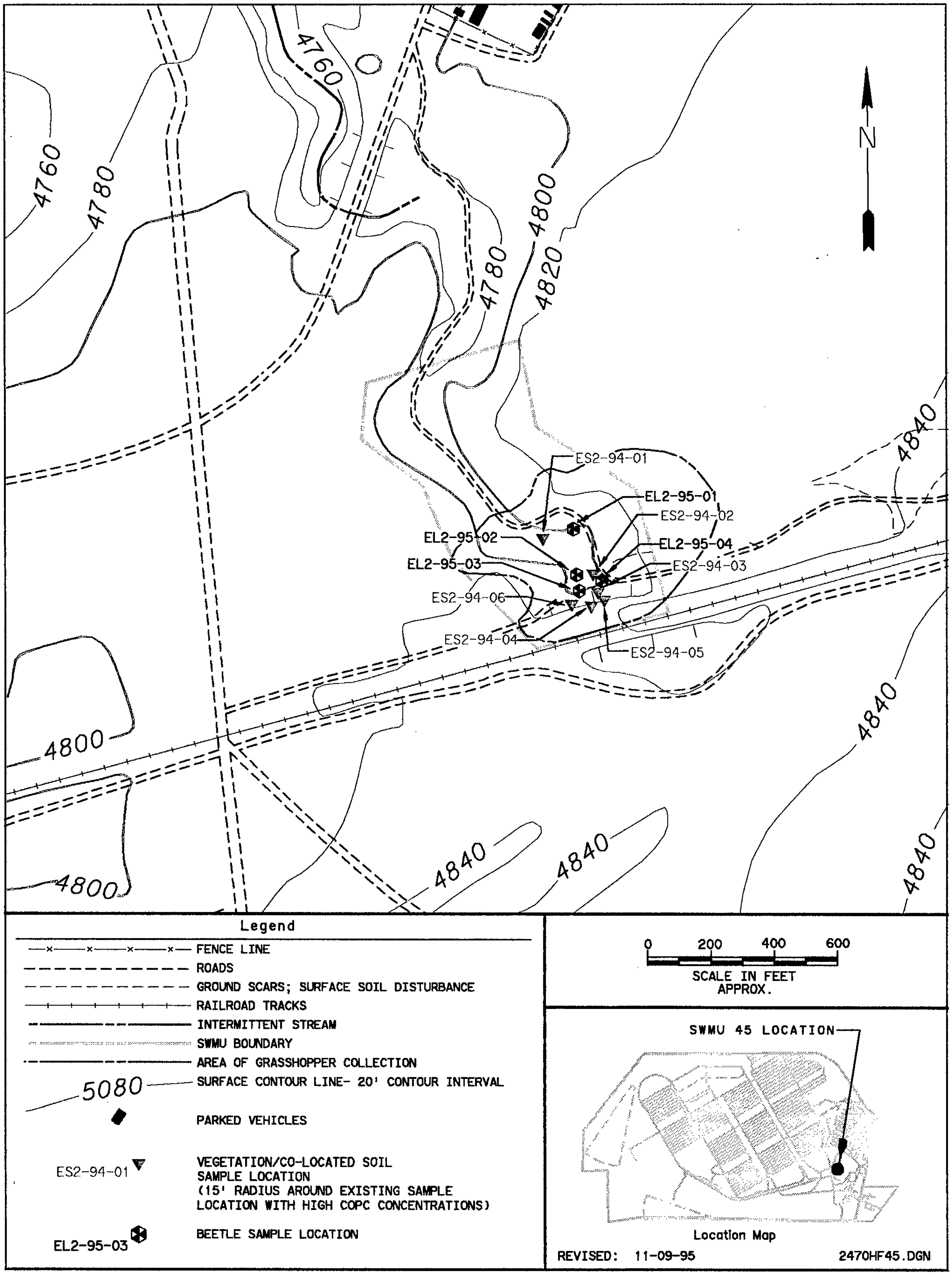

Figure 5-2. Sample Locations for the Stormwater Discharge (SWMU 45)

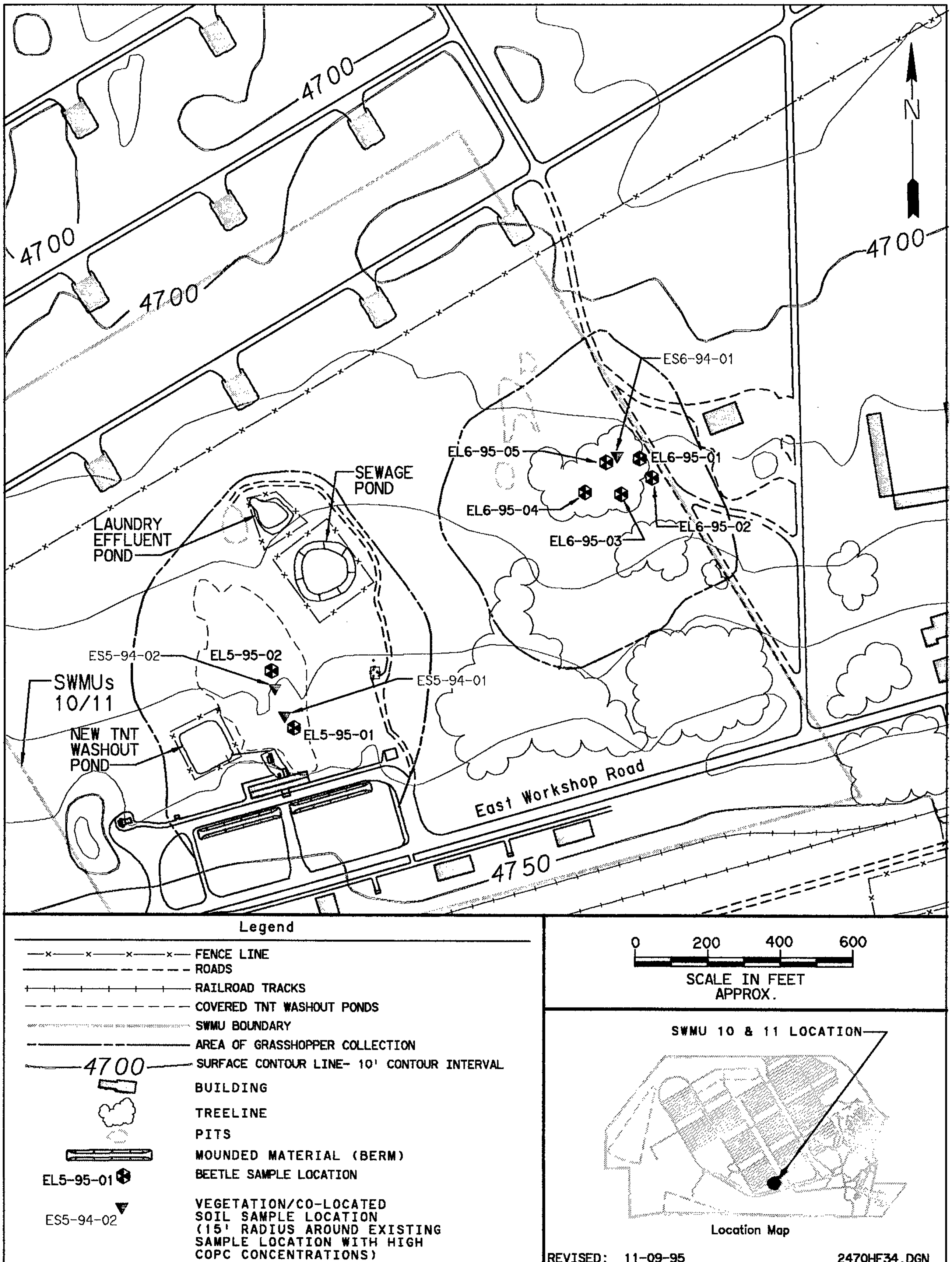

Figure 5-3. Sample Locations for the TNT Washout Facility/Laundry Effluent Ponds (SWMU 10/11)

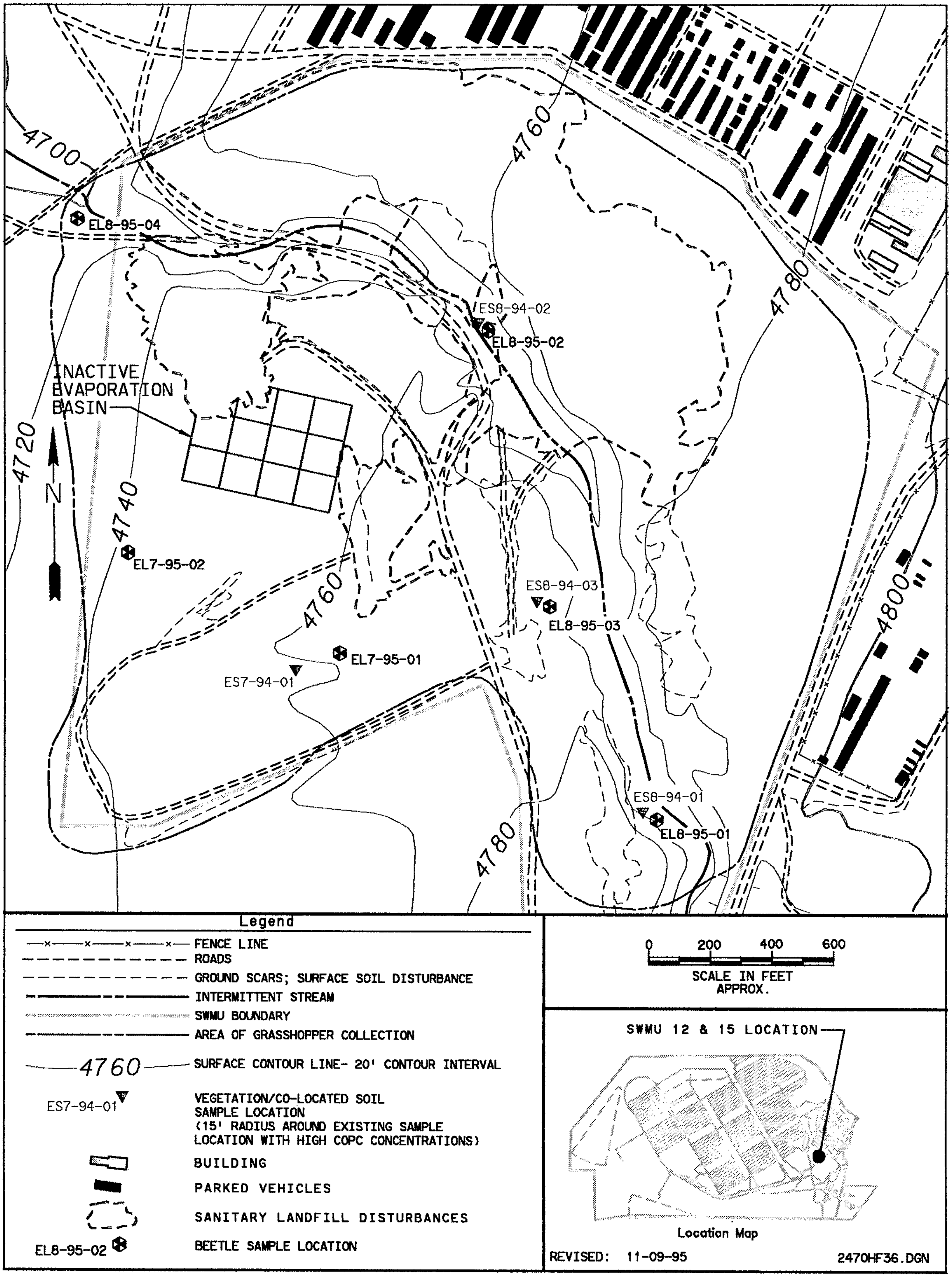

Figure 5-4. Sample Locations at the Pesticide Disposal/Sanitary Landfill (SWMUs 12/15)

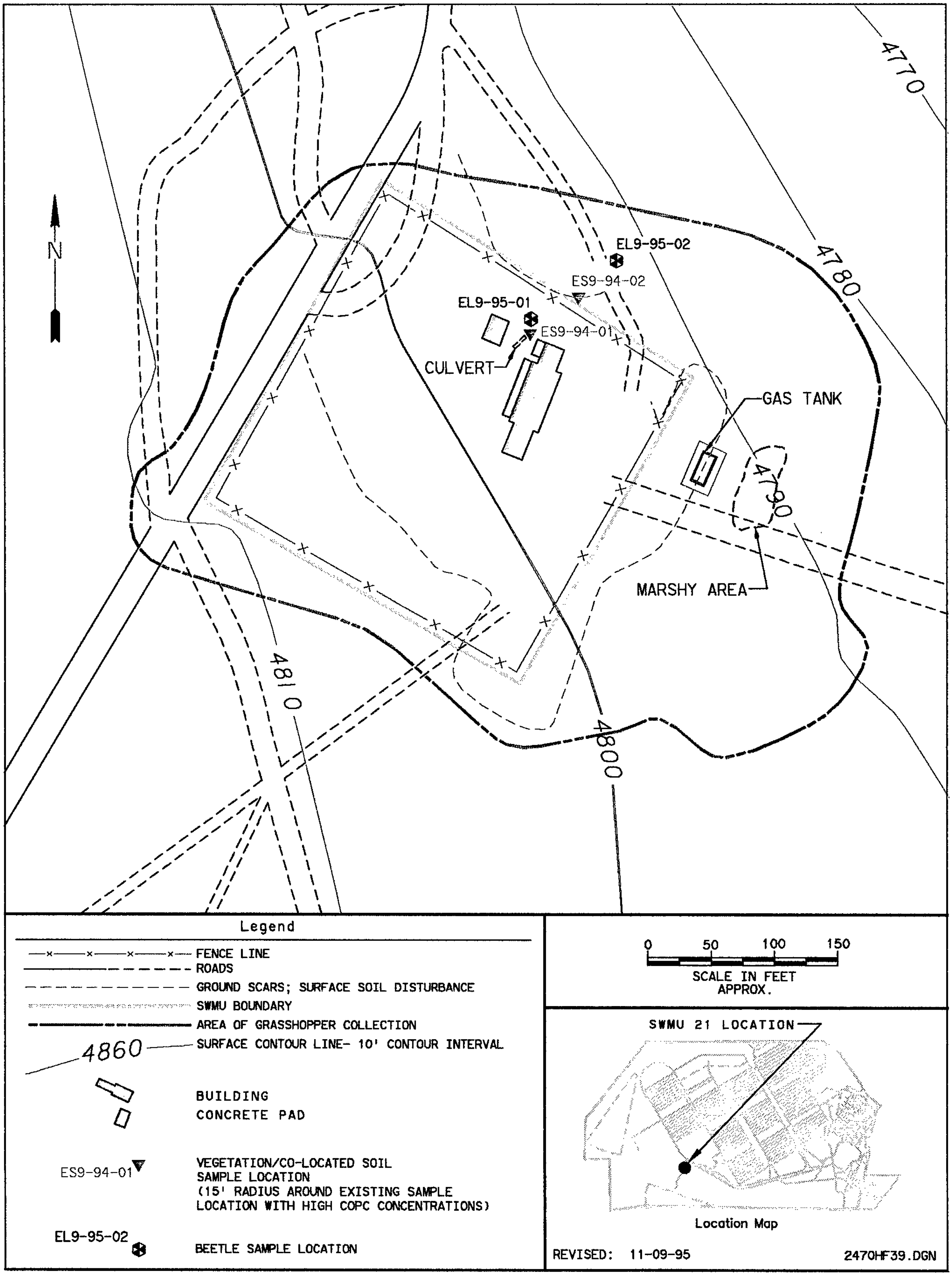

Figure 5-5. Sample Locations for the AED Deactivation Furnace (SWMU 21)

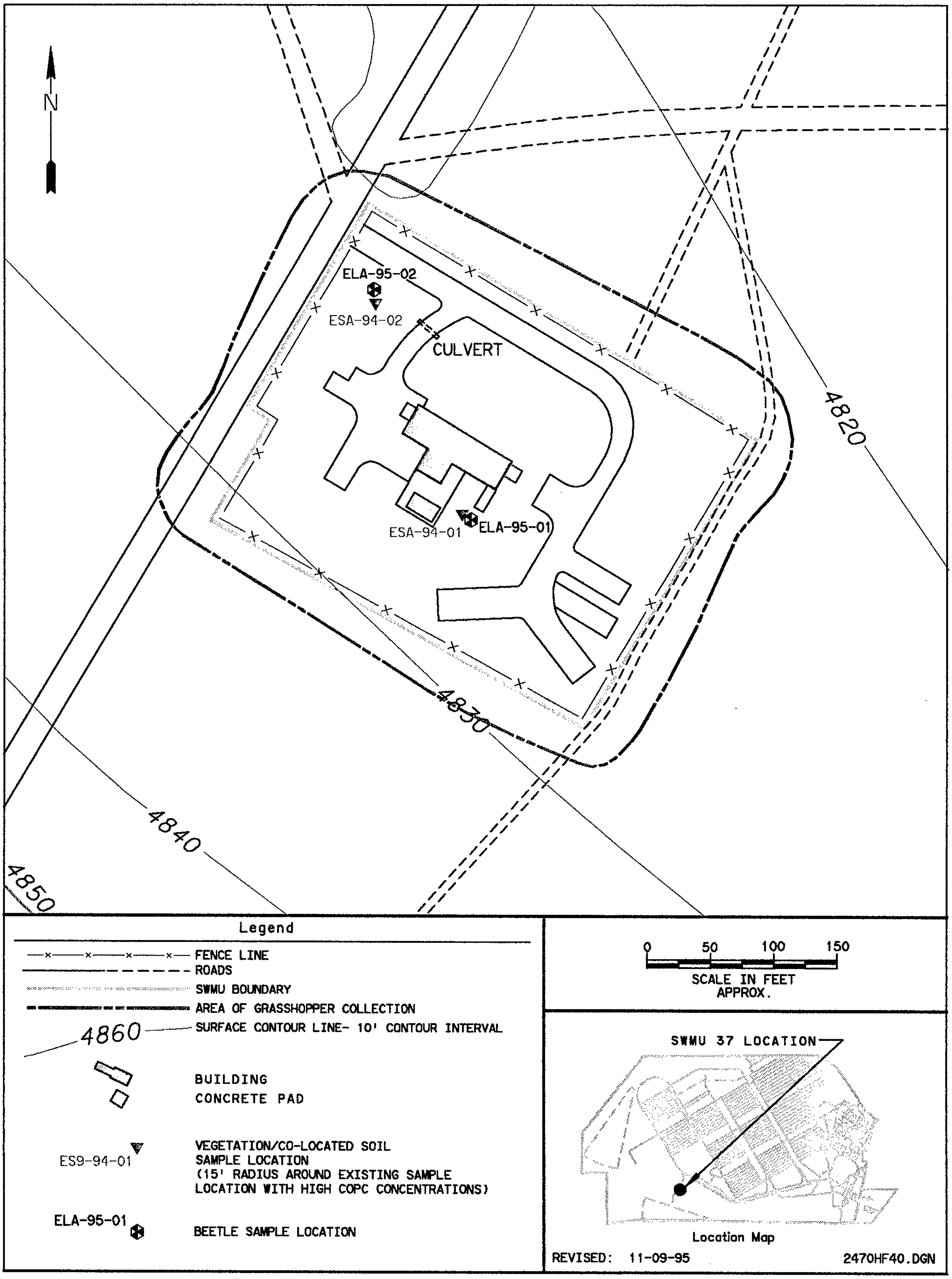

Figure 5-6. Sample Locations at the Contaminated Waste Processor (SWMU 37)

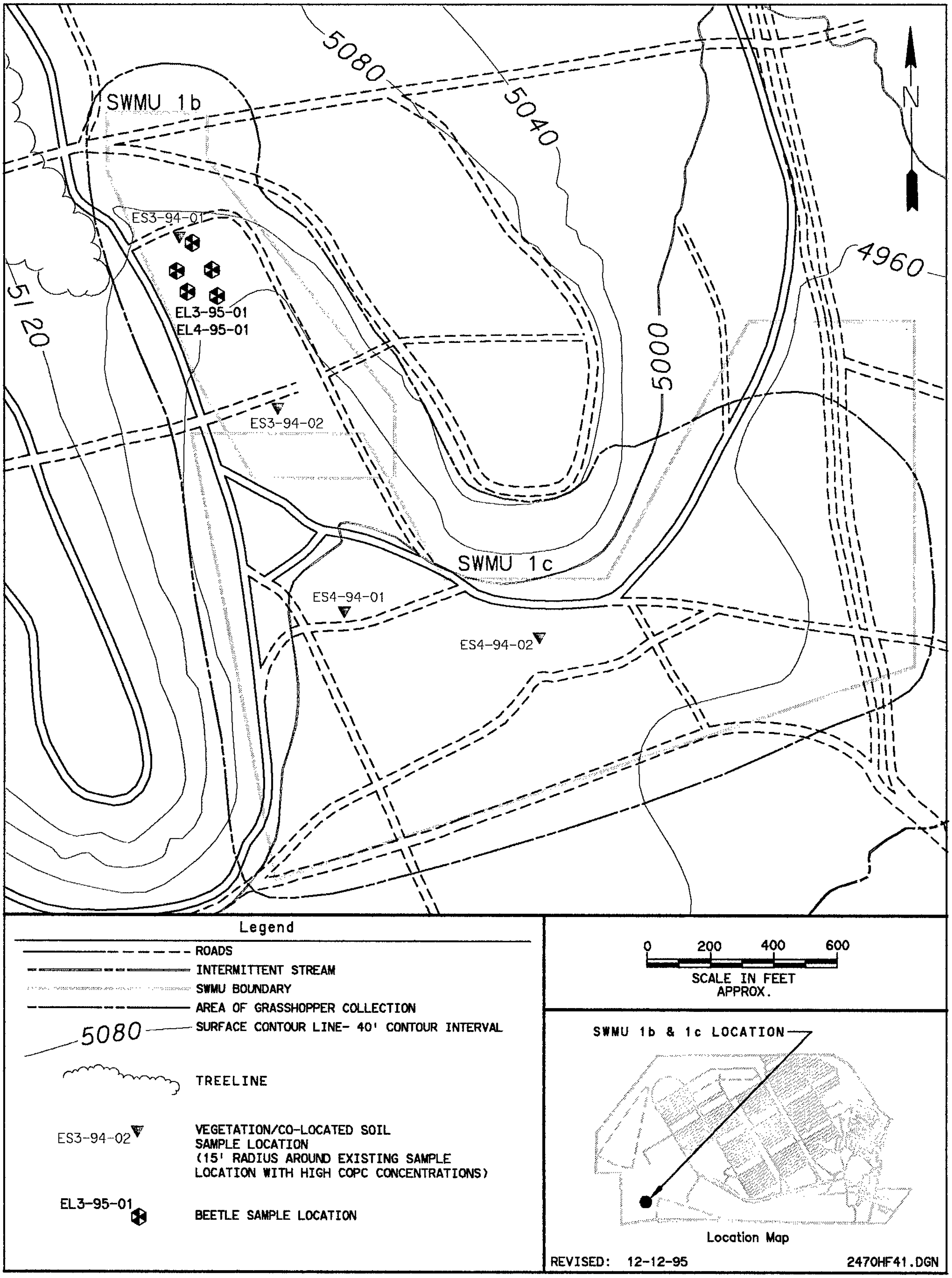

Figure 5-7. Sample Locations for the Open Burn/Open Detonation - Burn Pads/Trash Burn Pits (SWMUs 1b/1c)

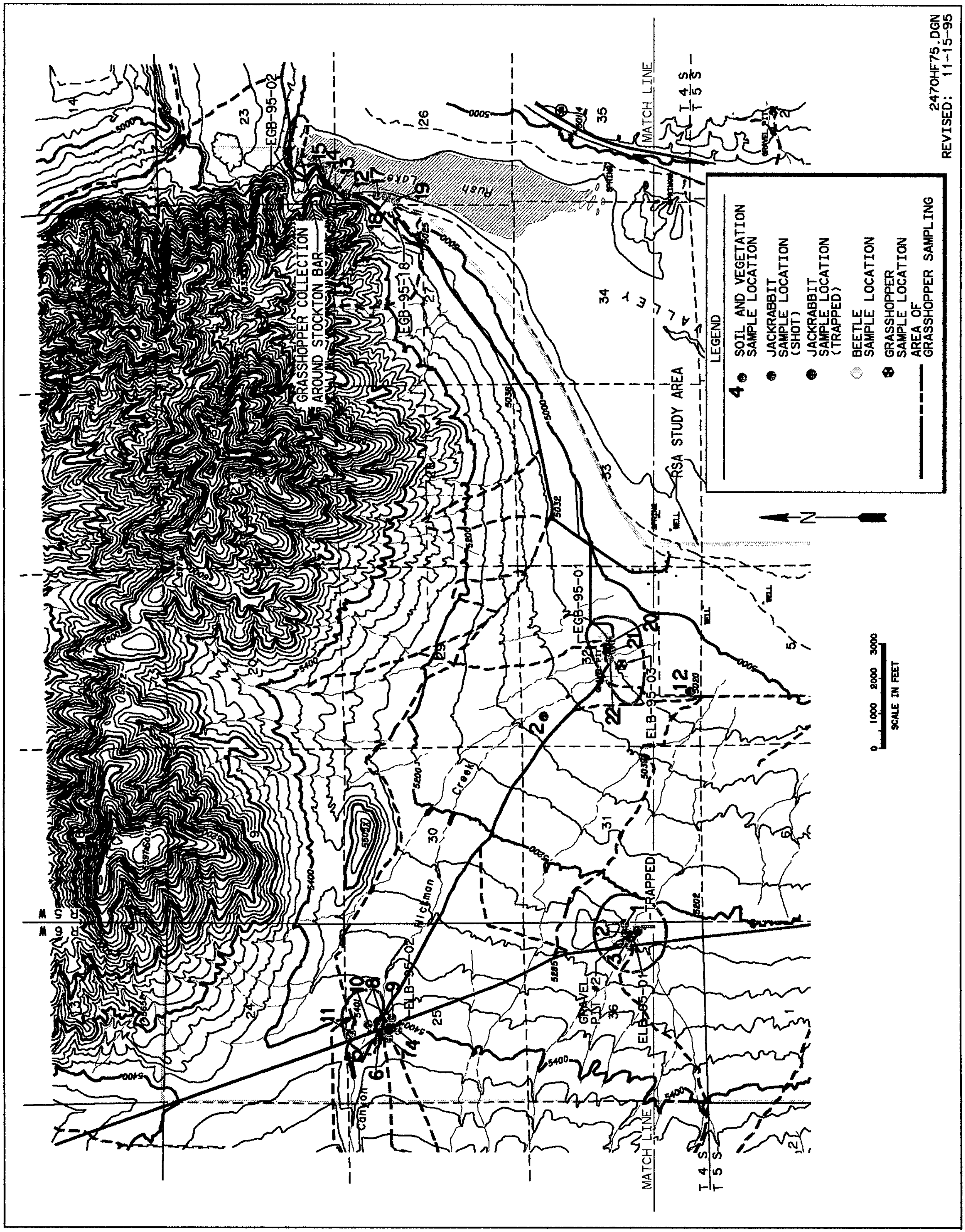

Figure 5-8. Sample Locations at the Reference Study Area (RSA) - Northern Portion

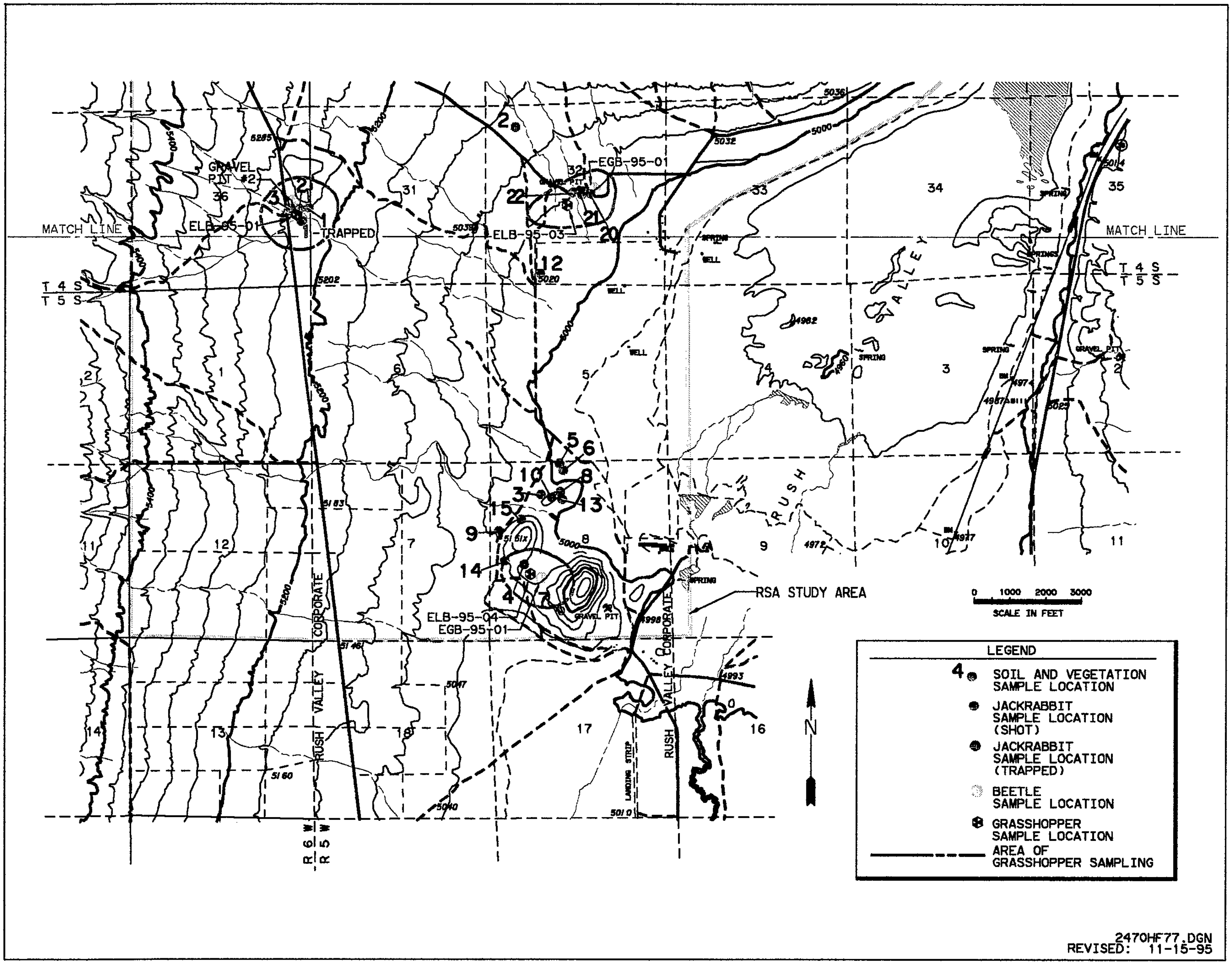

Figure 5-9. Sample Locations at the Reference Study Area (RSA) - Southern Portion

Table 5-2. Summary of Soil Sample Analytical Results for the Bomb Washout Building (SWMU 42)

Test Name	Analytes	TEAD UBC	RSA UBC	ES1-94-01	ES1-94-02	ES1-94-02(D)	ES1-94-03	ES1-94-04
CYANIDE	CYANIDE	5	0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25
DIOXINS	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	N/A	N/A	LT 0.0000047	LT 0.0000174	LT 0.0000159	LT 0.0000072	LT 0.0000084
	2,3,7,8 TETRACHLORODIBENZODIOXIN	N/A	N/A	LT 0.0000081	LT 0.0000233	LT 0.0000167	0.0000175	LT 0.0000102
	OCTACHLORODIBENZODIOXIN	N/A	N/A	0.000289	LT 0.0000736	0.000472	0.000261	0.000241
EXPLOSIVES	2,4-DINITROTOLUENE	N/A	N/A	LT 2.5	LT 2.5	LT 2.5	LT 2.5	LT 2.5
METALS	ALUMINUM	28083	17300	702*-	723*-	704*-	1130*-	534*-
	ANTIMONY	15	1	2.35*	349	333	94	88.5
	ARSENIC	14.5	8.86	23.3	27.2	22.4	18	15.1
	BARIUM	247.1	134	15*-	438	484	318	128*-
	BERYLLIUM	1.455	0.82	LT 0.427	0.52*-	0.516*-	0.535*-	0.542*-
	CADMIUM	0.847	1.2	LT 1.2	13.8	14.3	4.89	3.26
	CALCIUM	114483	35548	6220*-	722*-	848*-	1070*-	968*-
	CHROMIUM	20.62	22.6	1.22*-	10.2*-	11.6*-	7.44*-	3.19*-
	COBALT	6.94	7.99	LT 2.5	9.8	9.75	5.4*-	5.26*-
	COPPER	24.72	17.24	26.9	124	139	87.5	27.7
	IRON	22731	17400	935*-	1000*-	1030*-	1470*-	683*-
	LEAD	32.49	73.3	17.2*-	706	767	499	173
	MAGNESIUM	13114	6311	789*-	540*-	580*-	645*-	298*-
	MANGANESE	698.3	499	22.5*-	17.7*-	18.2*-	30.6*-	15.4*-
	MERCURY	0.0572	0.07	0.0908	0.073	0.0925	LT 0.05	LT 0.05
	NICKEL	17.4	14.8	6.04*-	28.6	29.3	15.1*	12.8*-
	POTASSIUM	5449	3259	242*-	215*-	181*-	370*-	195*-
	SELENIUM	0.449	0.449	LT 0.449	LT 0.449	LT 0.449	LT 0.449	LT 0.449
	SODIUM	632	282	105*-	111*-	109*-	99.4*-	97.7*-
	VANADIUM	28.39	24.3	11.7*-	13.4*-	11.9*-	12.3*-	13*-
	ZINC	102.8	127	8.46*-	56.7*-	60.4*-	45.4*-	12.5*-

Table 5-2. *Summary of Soil Sample Analytical Results for the Bomb Washout Building (SWMU 42) (continued)*

Test Name	Analytes	TEAD UBC	RSA UBC	ES1-94-01	ES1-94-02	ES1-94-02(D)	ES1-94-03	ES1-94-04
SEMIVOLATILES	2,4-DINITROTOLUENE	N/A	N/A	LT 1.4	LT 1.4	LT 1.4	LT 1.4	LT 1.4
	2-METHYLNAPHTHALENE	N/A	N/A	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	BENZO [A] ANTHRACENE	N/A	N/A	LT 0.041	LT 0.041	LT 0.041	LT 0.041	LT 0.041
	BENZO [K] FLUORANTHENE	N/A	N/A	LT 0.13	LT 0.13	LT 0.13	LT 0.13	LT 0.13
	CHRYSENE	N/A	N/A	LT 0.032	0.093	0.091	LT 0.032	LT 0.032
	DIETHYL PHTHALATE	N/A	N/A	LT 0.24	LT 0.24	20	LT 0.24	LT 0.24
	FLUORANTHENE	N/A	N/A	LT 0.032	0.046	0.039	LT 0.032	LT 0.032
	PHENANTHRENE	N/A	N/A	LT 0.032	0.13	0.11	LT 0.032	LT 0.032
	PYRENE	N/A	N/A	LT 0.083	0.15	LT 0.083	LT 0.083	LT 0.083
PESTICIDES/PCBS	BETA-ENDOSULFAN	N/A	N/A	LT 0.0007	LT 0.0007	LT 0.0007	LT 0.0007	LT 0.0007
	DDE	N/A	N/A	LT 0.0027	0.00332	LT 0.0027	LT 0.0027	LT 0.0027
	DDT	N/A	N/A	LT 0.0035	0.005	0.0044	LT 0.0035	LT 0.0035
	DIELDRIN	N/A	N/A	LT 0.0016	LT 0.0016	LT 0.0016	LT 0.0016	LT 0.0016

Table 5-2. *Summary of Soil Sample Analytical Results for the Bomb Washout Building (SWMU 42) (continued)*

Test Name	Analytes	TEAD UBC	RSA UBC	ES1-94-05	ES1-94-06	ES1-94-07	ES1-94-08	ES1-94-09
CYANIDE	CYANIDE	5	0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	0.433*
DIOXINS	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	N/A	N/A	LT 0.0000051	0.0000619	LT 0.0000083	LT 0.0000073	0.000531
	2,3,7,8 TETRACHLORODIBENZODIOXIN	N/A	N/A	0.0000158	0.0000142	LT 0.000015	LT 0.0000127	LT 0.0000195
	OCTACHLORODIBENZODIOXIN	N/A	N/A	0.000106	0.000402	0.000167	0.000149	0.00255
EXPLOSIVES	2,4-DINITROTOLUENE	N/A	N/A	LT 2.5	10.4	LT 2.5	LT 2.5	LT 2.5
METALS	ALUMINUM	28083	17300	9600*-	1020*-	10700*-	1080*-	634*-
	ANTIMONY	15	1	35.9	113	6.9*	90.2	352
	ARSENIC	14.5	8.86	13.3*	17	18.1	11*	27
	BARIUM	247.1	134	312	352	203*	260	623
	BERYLLIUM	1.455	0.82	0.518*-	LT 0.427	0.605*-	0.497*-	0.51*-
	CADMIUM	0.847	1.2	LT 1.2	5.54	1.41	5.14	2.14
	CALCIUM	114483	35548	5340*-	728*-	6270*-	582*-	1570*-
	CHROMIUM	20.62	22.6	18.5*-	7.7*-	15.6*-	6.81*-	18.9*-
	COBALT	6.94	7.99	4.62*-	5.67*-	4.87*-	4.4*-	12.1
	COPPER	24.72	17.24	65	98.5	53.6	82.3	133
	IRON	22731	17400	11000*-	1360*-	13000*-	1240*-	865*-
	LEAD	32.49	73.3	299	532	392	456	822
	MAGNESIUM	13114	6311	3820*-	618*-	4110*-	787*-	759*-
	MANGANESE	698.3	499	315*-	32.3*-	365*-	29.3*-	18*-
	MERCURY	0.0572	0.07	0.0632-	LT 0.05	LT 0.05	LT 0.05	0.185
	NICKEL	17.4	14.8	7.71*-	13.8*-	8.24*-	10.8*-	28.3
	POTASSIUM	5449	3259	2850*-	327*-	3130*-	355*-	187*-
	SELENIUM	0.449	0.449	LT 0.449	LT 0.449	LT 0.449	LT 0.449	1.04
	SODIUM	632	282	83.7*-	86.2*-	105*-	86.1*-	167*-
	VANADIUM	28.39	24.3	11.4*-	10.5*-	13.9*-	11.5*-	12.2*-
	ZINC	102.8	127	92.4*-	51.2*-	117-	40.7*-	124-

Table 5-2. *Summary of Soil Sample Analytical Results for the Bomb Washout Building (SWMU 42) (continued)*

Test Name	Analytes	TEAD UBC	RSA UBC	ES1-94-05	ES1-94-06	ES1-94-07	ES1-94-08	ES1-94-09
SEMIVOLATILES	2,4-DINITROTOLUENE	N/A	N/A	LT 1.4	1.8	LT 1.4	LT 1.4	LT 1.4
	2-METHYLNAPHTHALENE	N/A	N/A	LT 0.032	LT 0.032	LT 0.032	LT 0.032	0.11
	BENZO [A] ANTHRACENE	N/A	N/A	LT 0.041	0.14	LT 0.041	LT 0.041	0.13
	BENZO [K] FLUORANTHENE	N/A	N/A	LT 0.13	LT 0.13	LT 0.13	LT 0.13	0.25
	CHRYSENE	N/A	N/A	LT 0.032	0.18	LT 0.032	0.098	0.28
	DIETHYL PHTHALATE	N/A	N/A	LT 0.24	LT 0.24	LT 0.24	LT 0.24	LT 0.24
	FLUORANTHENE	N/A	N/A	LT 0.032	0.12	LT 0.032	0.058	0.14
	PHENANTHRENE	N/A	N/A	LT 0.032	0.18	LT 0.032	0.1	0.42
	PYRENE	N/A	N/A	LT 0.083	0.39	LT 0.083	0.24	0.4
PESTICIDES/PCBS	BETA-ENDOSULFAN	N/A	N/A	LT 0.0007	LT 0.0007	LT 0.0007	LT 0.0007	0.00101
	DDE	N/A	N/A	LT 0.0027	LT 0.0027	LT 0.0027	LT 0.0027	LT 0.0027
	DDT	N/A	N/A	LT 0.0035	LT 0.0035	LT 0.0035	LT 0.0035	0.00696
	DIELDRIN	N/A	N/A	LT 0.0016	LT 0.0016	LT 0.0016	0.00255	LT 0.0016

Note.—All values in $\mu g/g$ (equal to ppm).

N/A = Not Applicable.

LT = Analyte concentration is less than Certified Reporting Limit.

* = Analyte concentration is less than TEAD UBC.

˜ = Analyte concentration is less than RSA UBC.

(D) = Duplicate analysis.

ppb in three samples (ES1-94-03, -05, and -06). Octachlorodibenzodioxin, nonspecific, was detected in all nine samples at concentrations ranging from 0.10 ppb to 2.55 ppb. Similar concentrations of these contaminants were also reported, during the previous RFI, north of Building 539 beneath the ash piles in both surface and subsurface soils. These compounds, although low in concentration, are expected to be persistent in the environment.

Pesticides/PCBs

Sample ES1-94-02 and its duplicate, located in the drainage ditch, contained detectable amounts of p,p-DDT (2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane). However, the results were flagged with a "U" for unconfirmed. This sample did, however, have a confirmed detection of p,p-DDE (2,2-bis (p-chlorophenyl)-1,1-dichloroethene) at 3.32 ppb. Dieldrin in sample ES1-94-08 and beta-endosulfan in sample ES1-94-09 were also detected but flagged as unconfirmed. Sample ES1-94-09 also had a confirmed detection of p,p-DDT at 6.96 ppb. No pesticides/PCBs were reported in the previous RFI.

Explosives

One sample (ES1-94-06) had a detection of 2,4-DNT (2,4-dinitrotoluene) at 10.4 ppm. This detection is consistent with the previous RFI where two samples were found to contain 2,4-DNT within the ditch and ponding area.

SVOCs

Sample ES1-94-09, within the ponding area, contained detections of 2-methylnaphthalene (0.11 μg/g), pyrene (0.4 μg/g), benzo(a)anthracene (0.13 μg/g), benzo(k)fluoranthene (0.25 μg/g), chrysene (0.28 μg/g), fluoranthene (0.14 μg/g), and phenanthrene (0.42 μg/g). Samples ES1-94-02, -06, and -08 also contained low concentrations of pyrene, chrysene, fluoranthene, and phenanthrene. Diethyl phthalate was detected in one sample (ES1-94-02) but not in its duplicate, which may be indicative of laboratory contamination. Previous investigations did not evaluate potential SVOC contamination at SWMU 42; however, SVOC detections were in low concentrations.

5.1.2 Biota Sample Results

Nine rabbitbrush samples (EB1-94-01 through EB1-94-09), eight sweetclover samples (EC1-94-01 through -06, and EC1-94-08 and 09), and one gumweed sample (EM1-94-07) were collected and analyzed for selected COPCs at SWMU 42. In addition, one bluegrass sample (EU1-94-07) was collected but was not chemically analyzed due to the small amount of material and a lack of material for comparison at the RSA. No jackrabbits were collected at this SWMU. Four *composite* grasshopper samples (EG1-95-01C through EG1-95-04C) and two *composite* beetle samples (EL1-95-01C and EL1-95-02C) were collected at SWMUs 42 and 45. Results of analyses for SWMU 42 biota are summarized in Tables 5-3, 5-4, and 5-5.

Table 5-3. *Summary of Biota Sample Metal Results for the Bomb Washout Building (SWMU 42)*

Test Name	Analytes	RSA Cterm	Gumweed EM1-94-07
METALS	ALUMINUM	199.3	136 *
	ARSENIC	0.315	0.93
	BARIUM	19.2	30.9
	CADMIUM	0.5765	0.45 *
	CHROMIUM	0.4501	0.48
	COBALT	0.0879	0.13
	COPPER	9.705	9.5 *
	IRON	176.2	139 *
	LEAD	1.428	31.2
	MANGANESE	39.97	18.4 *
	NICKEL	2.293	1.1 *
	VANADIUM	0.2452	0.19 *
	ZINC	21.31	23.2

Test Name	Analytes	RSA Cterm	Rabbitbrush EB1-94-01	Rabbitbrush EB1-94-01 DUP	Rabbitbrush EB1-94-02	Rabbitbrush EB1-94-03	Rabbitbrush EB1-94-04	Rabbitbrush EB1-94-05	Rabbitbrush EB1-94-06
METALS	ALUMINUM	106.6	84.7 *	85.2591 *	67.8 *	108	56.3 *	55.4 *	77.9 *
	ANTIMONY	0.265	ND 0.5096	ND 0.5096	ND 0.5048	ND 0.5196	0.7	ND 0.4907	ND 0.5196
	ARSENIC	0.241	0.79	0.713	0.85	0.62	0.55	0.9	0.68999
	BARIUM	4.672	6.3	6.3441	99.4	61.6	91.1	8.1	18
	BERYLLIUM	0.003	ND 0.006	ND 0.006	NV	NV	NV	NV	NV
	CADMIUM	0.3042	0.19 *	0.2528 *	0.27 *	0.2 *	0.13 *	0.14 *	0.12 *
	CHROMIUM	0.2775	0.25 *	0.1991 *	0.36	0.31	0.43	0.25 *	0.31
	COBALT	0.048	ND 0.0954	ND 0.0954	0.1	0.11	ND 0.0949	ND 0.0952	ND 0.0956
	COPPER	4.815	6.9	6.8588	9.2	7	12.8	5.1	5.7
	IRON	103.5	106	106.2459	94.1 *	116	74.4 *	71.3 *	94.3 *
	LEAD	1.631	6.1	6.4139	21.1	15.6	30.5	4.8	6.8
	MANGANESE	33.68	15.6 *	15.7325 *	22.5 *	20.5 *	20.7 *	34.1	20.6 *
	MERCURY	0.0134	0.01 *	0.0122 *	0.01 *	0.01 *	0.01 *	ND 0.0099	0.01 *
	NICKEL	0.6769	0.57 *	0.4962 *	0.48 *	0.5 *	1.8	1.4	1.2
	VANADIUM	0.126	ND 0.0795	ND 0.0795	ND 0.0798	0.12 *	ND 0.0791	0.11 *	0.17
	ZINC	12.19	13.9	14.0764	26	16.3	20.2	11.3 *	11.5 *

Table 5-3. *Summary of Biota Sample Metal Results for the Bomb Washout Building (SWMU 42) (continued)*

Test Name	Analytes	RSA Cterm	Rabbitbrush EB1-94-07	Rabbitbrush EB1-94-08	Rabbitbrush EB1-94-09	Rabbitbrush EB1-94-09 DUP
METALS	ALUMINUM	106.6	126	44.7 *	55.7 *	132.6828
	ANTIMONY	0.265	ND 0.4907	ND 0.5096	0.96	ND 0.5
	ARSENIC	0.241	0.77	0.31	0.42	0.4552
	BARIUM	4.672	12	10.2	52.8	2.5779 *
	BERYLLIUM	0.003	NV	NV	NV	0.0124
	CADMIUM	0.3042	0.2 *	0.13 *	0.27 *	0.3267
	CHROMIUM	0.2775	0.35	0.34	0.68	0.3687
	COBALT	0.048	ND 0.0947	ND 0.095	ND 0.0954	ND 0.0951
	COPPER	4.815	8.8	5.3	13	4.2931 *
	IRON	103.5	145	58.4 *	74 *	144.593
	LEAD	1.631	14.8	6.8	47.8	2.4495
	MANGANESE	33.68	34.5	16.7 *	17.8 *	11.9425 *
	MERCURY	0.0134	ND 0.0099	ND 0.01	ND 0.01	0.0105 *
	NICKEL	0.6769	1.7	1.5	0.47 *	0.8971
	VANADIUM	0.126	0.2	0.08 *	ND 0.0795	0.1571
	ZINC	12.19	18.3	9 *	31	52.8299

Table 5-3. Summary of Biota Sample Metal Results for the Bomb Washout Building (SWMU 42) (continued)

Test Name	Analytes	RSA Cterm	Sweetclover EC1-94-01	Sweetclover EC1-94-02	Sweetclover EC1-94-03	Sweetclover EC1-94-04	Sweetclover EC1-94-05	Sweetclover EC1-94-06	Sweetclover EC1-94-08
METALS	ALUMINUM	40.95	33.6 *	24.3 *	63.2	35.7 *	28.4 *	35.3 *	25.1 *
	ANTIMONY	0.5	ND 0.9174	ND 0.9346	ND 0.92589	ND 0.9091	ND 0.9615	ND 0.9524	ND 0.9901
	ARSENIC	0.2804	0.93	0.33	0.36	0.29	0.31	0.32	0.39
	BARIUM	15.43	23.3	485	227	599	27.4	168	129
	CADMIUM	0.082	0.25	0.29	0.35	0.3	0.31	0.34	0.2
	CHROMIUM	0.2522	0.25 *	0.33	0.39	0.44	0.26	0.25 *	0.31
	COBALT	0.0958	0.09 *	0.49	0.27	0.54	0.11	0.21	0.2
	COPPER	5.9	3.7 *	3.7 *	4.2 *	6.3	2.9 *	3.5 *	5.2 *
	IRON	47.33	47.8	32 *	71.2	45.5 *	35.8 *	42.5 *	32 *
	LEAD	0.5018	3.8	11.6	13.1	30.1	3.6	11.6	20.2
	MANGANESE	11.2	8.5 *	8.2 *	9.4 *	11.8	10.1 *	11 *	11.2
	MERCURY	0.0121	0.03	0.01 *	0.01 *	0.01 *	0.01 *	0.02	ND 0.01
	NICKEL	0.634	0.55 *	0.76	0.47 *	0.43 *	0.27 *	1.5	0.45 *
	VANADIUM	0.0619	ND 0.1228	ND 0.123	0.14	ND 0.1218	ND 0.123	ND 0.1216	ND 0.1238
	ZINC	6.422	4.2 *	5.3 *	5.3 *	5 *	2.4 *	7.8	4 *

Test Name	Analytes	RSA Cterm	Sweetclover EC1-94-09
METALS	ALUMINUM	40.95	57.5
	ANTIMONY	0.5	1.6
	ARSENIC	0.2804	ND 0.283
	BARIUM	15.43	214
	CADMIUM	0.082	0.73
	CHROMIUM	0.2522	0.82
	COBALT	0.0958	0.26
	COPPER	5.9	10.8
	IRON	47.33	68.9
	LEAD	0.5018	71.4
	MANGANESE	11.2	13.4
	MERCURY	0.0121	0.01 *
	NICKEL	0.634	0.53 *
	VANADIUM	0.0619	ND 0.1225
	ZINC	6.422	13.6

Table 5-3. Summary of Biota Sample Metal Results for the Bomb Washout Building (SWMU 42) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL1-95-01C	Beetle EL1-95-02C
METALS	ALUMINUM	194.	117 *	69.2 *
	ANTIMONY	0.21	0.59	ND 0.1944
	ARSENIC	0.48	2.3	2.8
	BARIUM	2.6	5.7	3.5
	CADMIUM	0.15	0.44	0.28
	CHROMIUM	0.43	0.48	0.36 *
	COBALT	0.15	0.15	0.12 *
	COPPER	5.7	12.2	8.4
	IRON	213.	148 *	94.7 *
	LEAD	0.48	3.9	2.5
	MANGANESE	10.4	11.3	9.2 *
	MERCURY	0.01	0.03	0.02
	NICKEL	1.	0.88 *	0.48 *
	SELENIUM	0.13	0.17	0.17
	VANADIUM	0.31	0.24 *	0.17 *
	ZINC	43.2	56.9	53.5

Test Name	Analytes	RSA Cterm	Grasshopper EG1-95-01C	Grasshopper EG1-95-02C	Grasshopper EG1-95-03C
METALS	ALUMINUM	62.43	13.7 *	16.3 *	16 *
	BARIUM	1.994	1.1 *	1.4 *	1.5 *
	CADMIUM	0.5006	0.29 *	0.33 *	0.36 *
	CHROMIUM	0.3676	0.2 *	0.22 *	0.17 *
	COPPER	21.21	22	21.5	24.2
	IRON	79.76	29.4 *	33.9 *	34 *
	LEAD	0.523	0.38 *	0.36 *	0.57
	MERCURY	0.	0.01	0.01	0.01
	NICKEL	0.5127	0.75	0.79	0.78
	SELENIUM	0.2014	0.13 *	0.19 *	0.12 *
	ZINC	57.77	58.8	60.5	59

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.
DUP=Duplicate analysis.
NV=Not a Valid Detect.

Table 5-4. Summary of Biota Sample Dioxin/Furans Results for the Bomb Washout Building (SWMU 42)

Test Name	Analytes	RSA Cterm	Sweetclover EC1-94-01	Sweetclover EC1-94-02	Sweetclover EC1-94-02 DUP	Sweetclover EC1-94-03	Sweetclover EC1-94-04	Sweetclover EC1-94-05
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9342	ND 0.892	ND 0.405	ND 0.414	0.413 *	0.3712 *	ND 0.189
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3511	ND 0.253	ND 0.149	ND 0.162	NV	ND 0.115	0.08409 *
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3477	NV	0.2875 *	NV	0.3412 *	0.2739 *	NV
	2,3,7,8 TETRACHLORODIBENZODIOXIN	0.253	ND 0.125	ND 0.114	ND 0.122	ND 0.05	ND 0.079	ND 0.055
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2478	NV	NV	0.6458	NV	NV	NV
	OCTACHLORODIBENZODIOXIN	7.662	NV	1.845 *	1.6024 *	2.3095 *	1.8707 *	1.6095 *
	OCTACHLORODIBENZOFURAN	4.013	1.8672 *	0.5393 *	NV	0.9189 *	ND 0.415	0.4951 *
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.616	0.7036 *	ND 0.405	0.274 *	0.8307 *	0.3712 *	ND 0.189
	TOTAL HEPTACHLORODIBENZOFURANS	2.184	ND 0.471	ND 0.224	ND 0.24	0.2347 *	ND 0.178	0.167 *
	TOTAL HEXACHLORODIBENZOFURANS	0.9658	ND 0.24	0.2875 *	ND 0.153	0.4207 *	0.2739 *	0.08409 *
	TOTAL PENTACHLORODIBENZOFURANS	0.2157	ND 0.138	0.3918	0.2028 *	ND 0.05	0.124 *	0.2182
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.1402	ND 0.125	ND 0.114	ND 0.122	0.1976	0.1777	0.1459
	TOTAL TETRACHLORODIBENZOFURANS	0.3733	1.9532	1.1651	1.0339	0.4495	0.5139	0.2475 *

Test Name	Analytes	RSA Cterm	Sweetclover EC1-94-06	Sweetclover EC1-94-08	Sweetclover EC1-94-09
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9342	0.316 *	ND 1.68	2.1129
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3511	ND 0.144	ND 0.785	ND 0.531
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3477	NV	ND 0.754	NV
	2,3,7,8 TETRACHLORODIBENZODIOXIN	0.253	ND 0.098	ND 0.791	0.9432
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2478	NV	ND 0.68999	NV
	OCTACHLORODIBENZODIOXIN	7.662	2.1656 *	NV	117.2936
	OCTACHLORODIBENZOFURAN	4.013	0.4393 *	ND 1.894	2.8623 *
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.616	0.316 *	ND 1.68	4.7932
	TOTAL HEPTACHLORODIBENZOFURANS	2.184	ND 0.225	ND 1.069	0.74039 *
	TOTAL HEXACHLORODIBENZOFURANS	0.9658	ND 0.136	ND 0.743	1.0326
	TOTAL PENTACHLORODIBENZOFURANS	0.2157	0.225	ND 0.635	ND 0.318
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.1402	0.1607	ND 0.791	0.9432
	TOTAL TETRACHLORODIBENZOFURANS	0.3733	0.4293	ND 0.68999	0.8325

Table 5-4. Summary of Biota Sample Dioxin/Furans Results for the Bomb Washout Building (SWMU 42) (continued)

Test Name	Analytes	RSA Cterm	Gumweed EM1-94-07
DIOXIN	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.9946	3.0721
	TOTAL HEPTACHLORODIBENZOFURANS	0.909	0.6254 *

Test Name	Analytes	RSA Cterm	Rabbitbrush EB1-94-01	Rabbitbrush EB1-94-01 DUP	Rabbitbrush EB1-94-02	Rabbitbrush EB1-94-03	Rabbitbrush EB1-94-04	Rabbitbrush EB1-94-05
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	1.4569	1.2359	1.0809	ND 0.388	ND 1.079	ND 1.041
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	ND 0.132	0.6551	ND 0.262	0.4917 *	0.51859 *	0.3855 *
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.2849	NV	ND 0.173	NV	0.3146	ND 0.559	ND 0.548
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.5155	ND 0.065	ND 0.111	0.2002 *	ND 0.116	ND 0.376	ND 0.363
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2301	ND 0.049	0.4511	0.7441	0.2404	ND 0.293	ND 0.303
	OCTACHLORODIBENZODIOXIN	4.11	9.2898	10.5078	5.7865	5.9529	13.1364	5.3716
	OCTACHLORODIBENZOFURAN	1.127	1.7668	1.6263	1.2824	1.4168	1.4587	ND 1.223
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	2.924	2.8154	1.0809 *	ND 0.388	1.224 *	1.1149 *
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	0.4758 *	0.6551 *	ND 0.318	0.4917 *	0.51859 *	0.3855 *
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.8575	NV	ND 0.257	NV	0.3238 *	ND 0.838	ND 0.824
	TOTAL HEXACHLORODIBENZOFURANS	1.145	0.5807 *	ND 0.168	0.4196 *	0.3146 *	ND 0.537	ND 0.525
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	0.497	ND 0.111	0.2002 *	0.1643 *	ND 0.388	ND 0.375
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.203	0.2297	ND 0.1	ND 0.115	ND 0.126	ND 0.394	ND 0.421
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	0.7729	1.7481	2.4344	0.2404 *	ND 0.293	ND 0.303

Test Name	Analytes	RSA Cterm	Rabbitbrush EB1-94-06	Rabbitbrush EB1-94-07	Rabbitbrush EB1-94-08	Rabbitbrush EB1-94-09	Rabbitbrush EB1-94-09 DUP
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	ND 0.994	1.7024	ND 0.534	0.967 *	ND 1.64
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	ND 0.495	ND 0.413	0.3343 *	ND 0.332	ND 0.68999
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.2849	ND 0.505	ND 0.431	ND 0.284	0.2995	ND 0.53
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.5155	ND 0.312	ND 0.303	ND 0.197	ND 0.257	ND 0.351
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2301	ND 0.261	ND 0.264	ND 0.157	0.4626	ND 0.293
	OCTACHLORODIBENZODIOXIN	4.11	ND 1.544	9.5244	4.8308	6.4301	5.4069
	OCTACHLORODIBENZOFURAN	1.127	ND 1.268	1.6679	ND 0.584	ND 1.563	ND 2.413
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	ND 0.994	2.9852	ND 0.534	NV	ND 1.64
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	ND 0.604	ND 0.505	0.3343 *	ND 0.413	ND 0.857
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.8575	ND 0.819	ND 0.647	ND 0.426	ND 0.487	ND 0.993
	TOTAL HEXACHLORODIBENZOFURANS	1.145	ND 0.484	ND 0.414	ND 0.272	0.2995 *	ND 0.523
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	ND 0.322	ND 0.313	ND 0.203	ND 0.261	ND 0.357
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.203	ND 0.351	ND 0.336	ND 0.224	ND 0.206	ND 0.325
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	ND 0.261	ND 0.264	ND 0.157	0.4626 *	ND 0.293

Table 5-4. Summary of Biota Sample Dioxin/Furans Results for the Bomb Washout Building (SWMU 42) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL1-95-01C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.305	7.8251
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.259	1.0495
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.4855	0.293 *

Test Name	Analytes	RSA Cterm	Grasshopper EG1-95-01C	Grasshopper EG1-95-02C	Grasshopper EG1-95-03C
DIOXIN	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.7685	NV	NV	0.7136 *
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.582	ND 0.245	0.1138 *	ND 0.15
	TOTAL HEXACHLORODIBENZOFURANS	0.3216	0.2974 *	ND 0.27	0.2959 *

Note.—All values in ng/kg (equal to ppt).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.
NV=Not a Valid Detect.
DUP=Duplicate analysis.

Table 5-5. Summary of Remaining Biota Sample Analytical Results for the Bomb Washout Building (SWMU 42)

Test Name	Analytes	RSA Cterm	Gumweed EM1-94-07	Gumweed EM1-94-07 DUP
PAH	CHRYSENE	0.345	2.6	NS
	FLUORANTHENE	1.8	14	NS
	PHENANTHRENE	9.39	69	NS
	PYRENE	0.9	8.1	NS

Test Name	Analytes	RSA Cterm	Rabbitbrush EB1-94-01	Rabbitbrush EB1-94-01 DUP	Rabbitbrush EB1-94-02	Rabbitbrush EB1-94-03	Rabbitbrush EB1-94-04	Rabbitbrush EB1-94-04 DUP
PAH	CHRYSENE	0.5024	1.1	1.1	1.1	0.9	2.4	NS
	FLUORANTHENE	2.227	14	15	17	11	21	NS
	PHENANTHRENE	7.8	110	120	120	100	140	NS
	PYRENE	0.78	4.3	4.8	6.7	3.5	7	NS
PESTICIDES	DDE	61.56	78	170	130	ND 34	ND 34	NS

Test Name	Analytes	RSA Cterm	Rabbitbrush EB1-94-05	Rabbitbrush EB1-94-06	Rabbitbrush EB1-94-07	Rabbitbrush EB1-94-08	Rabbitbrush EB1-94-09	Rabbitbrush EB1-94-09 DUP
PAH	CHRYSENE	0.5024	1.1	1.2	2.6	0.87	0.98	0.91
	FLUORANTHENE	2.227	11	15	29	8	10	9.3
	PHENANTHRENE	7.8	100	130	190	80	89	78
	PYRENE	0.78	3.4	4.7	9.7	2.7	3.3	2.6
PESTICIDES	DDE	61.56	ND 34	62	ND 34	ND 34	67	56 *

Test Name	Analytes	RSA Cterm	Sweetclover EC1-94-01	Sweetclover EC1-94-01 DUP	Sweetclover EC1-94-02	Sweetclover EC1-94-03	Sweetclover EC1-94-04	Sweetclover EC1-94-05
PAH	FLUORANTHENE	0.8689	1.6	NS	1.3	2.3	1.6	1.6
	PHENANTHRENE	3.123	6.3	NS	5.9	8.7	5.8	5.3
	PYRENE	0.3947	0.78	NS	0.54	0.93999	0.76	0.64

Test Name	Analytes	RSA Cterm	Sweetclover EC1-94-06	Sweetclover EC1-94-08	Sweetclover EC1-94-08 DUP	Sweetclover EC1-94-09
PAH	FLUORANTHENE	0.8689	1.4	1.7	1.8	2
	PHENANTHRENE	3.123	6.6	6.1	6.5	7.3
	PYRENE	0.3947	0.64	0.84	0.86	0.86

Table 5-5. Summary of Remaining Biota Sample Analytical Results for the Bomb Washout Building (SWMU 42) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL1-95-01C	Beetle EL1-95-02C
PESTICIDES	DDE	5.5	20	43
	DDT	0.215	14	7.8

Test Name	Analytes	RSA Cterm	Grasshopper EG1-95-01C	Grasshopper EG1-95-02C	Grasshopper EG1-95-03C
PESTICIDES	DDE	0.5	1.7	1.1	ND 0.86
	DDT	0.4759	ND 0.43	1.2	ND 0.43

Note.—All values in μg/kg (equal to ppb).
PAH=Polynuclear Aromatic Hydrocarbon.
RSA=Reference Study Area.
Cterm=Concentration Term.
DUP=Duplicate analysis.
NS=Matrix not sampled at this location.
ND=Analyte not detected in sample.
*=Analyte concentration is less than Cterm.

Inorganics

A total of 11 metals were detected in all 11 (9 samples plus 2 duplicates) rabbitbrush samples collected at SWMU 42. These metals and the range of their detected values are aluminum (44.7 ppm to 132.7 ppm); arsenic (0.31 to 0.9 ppm-all values have a "B"qualifier signifying values below CRDLs but above the instrument detection limits); barium (2.6—"B" qualified—to 99.4 ppm); cadmium (0.12 to 0.33 ppm-all values "B" qualified); chromium (0.20 to 0.68 ppm); copper (4.3 to 13 ppm); iron (58.4 to 145 ppm); manganese (11.9 to 34.5 ppm); nickel (0.47 ("B") to 1.8 ppm); lead (2.4 to 47.8 ppm); and zinc (9 to 52.8 ppm). Mercury was detected in 7 of 11 samples (all values reported at 0.01 ppm). Similarly, beryllium concentration was reported as 0.01 ppm in 1 of the 11 samples. The beryllium value was qualified. Cobalt was detected in samples EB1-94-02 at 0.10 ppm, EB1-94-02 at 0.11 ppm, and EB1-94-03 at the 0.10 ppm level. Vanadium was detected in six rabbitbrush samples with values ranging from 0.08 ppm to 0.2 ppm (all "B" qualified). Antimony was detected in samples EB1-94-04 (0.7 ppm ("B") and EB1-94-09 (0.96 ppm ("B")).

A total of 11 metals were detected in all 8 SWMU 42 sweetclover samples. These metals and the range of detected values are aluminum (24.3 to 63.2 ppm); barium (23.3 to 599 ppm); cadmium (0.2 ("B") to 0.73 ppm); cobalt (0.09 to 0.54 ppm, all "B" qualified); chromium (0.25 to 0.82 ppm); copper (2.9 to 10.8 ppm); iron (32 to 71.2 ppm); manganese (8.2 to 13.4 ppm); nickel (0.27 ("B") to 1.5 ppm); lead (3.6 to 71.4 ppm); and zinc (2.4 to 13.6 ppm). Arsenic was detected in seven samples with a reported range of 0.29 to 0.93 ppm (all values "B" qualified). Mercury was also detected in seven of the eight sweetclover samples. Values for mercury ranged from 0.01 to 0.03 ppm. Vanadium was detected only in sample EC1-94-03 at a value of 0.14 ppm ("B"). Antimony was detected only in Sample EC1-94-09 at a value of 1.6 ppm ("B").

A total of 13 metals were detected in the single SWMU 42 gumweed sample. They are aluminum (136 ppm), arsenic (0.93 ppm-"B"qualified), barium (30.9 ppm), cadmium (0.45 ppm-"B"qualified), cobalt (0.13 ppm-"B" qualified), chromium (0.48 ppm), copper (9.5 ppm), iron (139 ppm), manganese (18.4 ppm), nickel (1.1 ppm), lead (31.2 ppm), vanadium (0.19 ppm-"B" qualified), and zinc (23.2 ppm).

A total of 15 metals were detected in both beetle samples (EL1-95-01C and EL1-95-02C) from SWMUs 42 and 45: aluminum (117 and 69.2 ppm), arsenic (2.3 and 2.8 ppm), barium (5.7 and 3.5 ppm), cadmium (0.44 and 0.28 ppm), cobalt (0.15 and 0.12 ppm), chromium (0.48 and 0.36 ppm), copper (12.2 and 8.4 ppm), iron (148 and 94.7 ppm), mercury (0.03 and 0.02 ppm), manganese (11.3 and 9.2 ppm), nickel (0.88 and 0.48 ppm), lead (3.9 and 2.5 ppm), selenium (0.17 and 0.17 ppm), vanadium (0.24 and 0.17 ppm), and zinc (56.9 and 53.5 ppm, respectively). In addition, sample EL1-95-01C reported a detect of 0.59 ppm of antimony. Similarly, 11 metals were detected in 3 grasshopper samples from SWMUs 42 and 45, EG1-95-01C, EG1-95-02C, and EG1-95-03C. The metals and the range of values for each are aluminum (13.7 to 16.3 ppm), barium (1.1 to 1.5 ppm), cadmium (0.29 to 0.36 ppm), chromium (0.17 to 0.22 ppm), copper (21.5 to 24.2 ppm), iron (29.4 to 34 ppm),

mercury (0.01 ppm for all three samples), nickel (0.75 to 0.79 ppm), lead (0.36 to 0.57 ppm), selenium (0.12 to 0.19 ppm), and zinc (58.8 to 60.5 ppm).

Dioxins/Furans

A variety of polychlorinated dibenzodioxins and dibenzofurans were reported. Five rabbitbrush samples (EB1-94-01, EB1-94-01dup, EB1-94-02, EB1-94-07, and EB1-94-09) had detectable quantities of 1234678-HpCDD, ranging from 0.97 to 1.7 ppt. Five samples (EB1-94-01dup, EB1-94-03, EB1-94-04, EB1-94-05, and EB1-94-08) had detectable quantities of 1234678-HpCDF, ranging from 0.33 to 0.65 ppt. Samples EBI-94-03 and -09 had 0.31 ppt and 0.30 ppt 234678-HxCDF, respectively. Rabbitbrush samples EB1-94-01dup, -02, -03, and -09 had reported values of 2378-TCDF, ranging from 0.24 to 0.74 ppt. Ten rabbitbrush samples (EB1-94-01, 01dup, -02, -03, -04, -05, -07, -08, -09, and -09dup) all contained OCDD with values ranging from 4.83 to 13.14 ppt. OCDF was detected in six rabbitbrush samples (EB1-94-01, -01dup, -02, -03, -04, and -07) with values ranging from 1.28 to 1.77 ppt. Total HpCDDs were reported in six samples (EB1-94-01, -01dup, -02, -04, -05, and -07) with values from 1.08 to 2.98 ppt. Similarly, total HpCDFs were detected in six samples (EB1-94-01, -01dup, -03, -04, -05, and -08), ranging from 0.33 to 0.65 ppt. Total HxCDFs were detected in four rabbitbrush samples (EB1-94-01, -02, -03, and -09) with values ranging from 0.30 to 0.58 ppt. Total PeCDFs were detected in EB1-94-01, -02, and -03 with values from 0.16 to 0.50 ppt. Total TCDFs were detected in five rabbitbrush samples (EB1-94-01, 01dup, -02, -03, and -09), with values ranging from 0.24 to 2.43 ppt. Single detections of 23478-PeCDF (sample EB1-94-02: 0.20 ppt), total HxCDD (sample EB1-94-03: 0.32 ppt), and total TCDD (sample EB1-94-01: 0.23 ppt) were also reported.

Four sweetclover samples—EC1-94-03, -04, -06, and -09—had detectable values of 1234678-HpCDD, ranging from 0.32 to 2.11 ppt. Three samples—EC1-94-02, -03, and -04—reported values of 234678-HxCDF from 0.27 to 0.34 ppt. Seven sweetclover samples (EC1-94-02, -02dup, -03 through -06, and -09) had detectable quantities of OCDD, ranging from 1.60 to 117.29 ppt (sample EC1-94-09). OCDF was detected in six sweetclover samples (EC1-94-01, -02, -03, -05, -06, and -09), ranging in value from 0.44 to 2.86 ppt. Six samples (EC1-94-01, -02dup, -03, -04, -06, and -09) had detections of total HpCDD, ranging from 0.27 to 4.79 ppt. Total HpCDFs were detected in three samples (EC1-94-03, -05, and -09) with values from 0.17 to 0.74 ppt. Total HxCDFs were found in five sweetclover samples (EC1-94-02, -03, -04, -05, and -09) with values ranging from 0.08 to 1.03 ppt. Likewise, five samples (EC1-94-02, -02dup, -04, -05, and -06) reported detections of total PeCDFs, ranging from 0.12 to 0.39 ppt. Total TCDDs were detected in five samples (EC1-94-03, -04, -05, -06, and -09), ranging from 0.15 to 0.94 ppt. Total TCDFs were detected in all eight sweetclover samples with values ranging from 0.25 to 1.95 ppt. Single detections of 123478-HxCDF (EC1-94-05: 0.08 ppt), 2378-TCDD (EC1-94-09: 0.94 ppt), and 2378-TCDF (EC1-94-02dup: 0.65 ppt) were reported for sweetclover samples.

The single gumweed sample, EM1-94-07, had detectable concentrations of total HpCDD at 3.07 ppt and total HpCDF at 0.63 ppt.

One beetle sample for SWMUs 42 and 45, EL1-95-01C, had detectable quantities of dioxins. Single detections of 1234678-HpCDD (7.83 ppt), 123678-HxCDD (1.05 ppt), and total PeCDD (0.29 ppt) were reported. Three grasshopper samples collected from these two SWMUs had detectable quantities of dioxins/furans. Total HxCDF was reported in samples EG1-95-01C and EG1-95-03C at a level of 0.30 ppt. Sample EG1-95-03C also had a detection of total HpCDD (0.71 ppt). Total HxCDD was detected in sample EG1-95-02C at a level of 0.11 ppt.

Explosives

No explosive compounds were detected in SWMU 42 biota samples. Grasshopper/beetle samples were not analyzed for explosives.

Herbicides

No herbicides were detected in SWMU 42 biota samples. Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

Four rabbitbrush samples (EB1-94-01, -02, -06, and -09) and two duplicates (EB1-94-01dup and -09dup) had detectable quantities of 4,4'-DDE, ranging from 56 ppb to 170 ppb.

Two beetle samples from SWMUs 42 and 45 had detectable quantities of 4,4'-DDE: sample EL1-95-01C at 20 ppb and EL1-95-02C at 43 ppb. The compound 4,4'-DDT was detected in the same two samples at levels of 14 ppb and 7.8 ppb, respectively. Also, 4,4'-DDE was detected in two grasshopper samples: EG1-95-01C at 1.7 ppb and EG1-95-02C at 1.1 ppb. The compound 4,4'-DDT was detected in sample EG1-95-02C at a level of 1.2 ppb. All grasshopper and beetle detects were qualified with a "J" code.

PAHs

All nine rabbitbrush samples (EB1-94-01 through EB1-94-09) plus duplicate samples for EB1-94-01 and -09 had detectable quantities of chrysene, fluoranthene, phenanthrene, and pyrene. Chrysene values ranged from 0.87 to 2.6 ppb; fluoranthene from 8 to 29 ppb; phenanthrene from 78 ppb to 190 ppb; and pyrene values ranged from 2.6 ppb to 9.7 ppb. All eight sweetclover samples (EC1-94-01, -02, -03, -04, -05, -06, -08, and -09) plus the duplicate for EC1-94-08 had detects of fluoranthene, phenanthrene, and pyrene. Fluoranthene values ranged from 1.3 ppb to 2.3 ppb; phenanthrene from 5.3 to 8.7 ppb; and pyrene from 0.54 to 0.94 ppb. The one gumweed sample (EM1-94-07) had detectable quantities of chrysene (2.6 ppb), fluoranthene (14 ppb), phenanthrene (69 ppb), and pyrene (8.1 ppb).

Grasshopper/beetle samples were not analyzed for PAHs.

5.2 SWMU 45 - STORMWATER DISCHARGE

5.2.1 Soil Sample Results

A total of six surface soil samples (ES2-94-01 through ES2-94-06) were collected at SWMU 45 at selected approximate locations of contamination previously identified by RFI investigations (Figure 5-2). The Stormwater Discharge Area consists of a small unlined stormwater pond and associated pipelines that discharge to the pond. The surface soil locations were all within the ponding area. Samples were analyzed for inorganics, dioxins/furans, pesticides/PCBs, explosives, and SVOCs. Results are presented in Table 5-6. Previous RFI results indicated the presence of above background concentrations of metals, pesticides, and one VOC (toluene).

Inorganics

Primary metals exceeding the RSA and TEAD UBCs at SWMU 45 were arsenic, cadmium, chromium, copper, lead, mercury, and zinc. Arsenic, ranging from 13.1 to 49 $\mu g/g$, exceeded both UBCs in five samples. Cadmium (1.3 to 7.0 $\mu g/g$) and lead (87 to 664 $\mu g/g$) also exceeded both UBCs in five of the six samples. Copper, mercury, and zinc exceeded both UBCs in four samples. Cyanide was also present in concentrations exceeding the RSA UBC of 0.25 $\mu g/g$ in four samples, but no cyanide detection exceeded the TEAD UBC of 5 $\mu g/g$.

The metals detected in the fall 1994 samples correspond well to the results of the previous RFI with the exception of silver, selenium, and thallium, which were detected in the previous study but not from the current sample results.

Dioxins/Furans

Octachlorodibenzodioxin, nonspecific, was detected in four of the six samples (ES2-94-01, -02, -03, and -04) with concentrations ranging from 0.96 ppb to 4.23 ppb. Analyses for dioxins/furans were not available from the previous RFI.

Pesticides/PCBs

Three samples (ES2-94-01, -03, and -04) had confirmed detections of p,p-DDT with concentrations ranging from 0.041 $\mu g/g$ to 0.049 $\mu g/g$. These same samples also had confirmed detections of p,p-DDD, ranging from 0.041 $\mu g/g$ to 0.092 $\mu g/g$. Alpha-chlordane was detected in three samples (ES2-94-01, -02 and its duplicate, and -03) with concentrations of 0.14, 0.12 and 0.12, and 0.053 $\mu g/g$, respectively. Gamma chlordane was also found in the same three samples with values ranging from 0.066 to 0.18 $\mu g/g$. Chlordane was detected in two samples (ES2-94-01 at 1.8 $\mu g/g$ and ES2-94-02 and its duplicate at 1.5 and 1.6 $\mu g/g$). These same samples contained dieldrin (0.27, 0.027, and 0.031 $\mu g/g$, respectively) and endrin (0.081, 0.078, and 0.077 $\mu g/g$, respectively). Endrin aldehyde was detected only in sample ES2-94-01 at a concentration of 0.0075 $\mu g/g$.

Table 5-6. Summary of Soil Sample Analytical Results for the Stormwater Discharge (SWMU 45)

Test Name	Analytes	TEAD UBC	RSA UBC	ES2-94-01	ES2-94-02	ES2-94-02(D)	ES2-94-03	ES2-94-04
CYANIDE	CYANIDE	5	0.25	0.674*	0.503*	0.638*	1.02*	0.489*
DIOXINS	OCTACHLORODIBENZODIOXIN	N/A	N/A	0.00423	0.00156	0.00118	0.00253	0.000961
METALS	ALUMINUM	28083	17300	14300*⁻	11500*⁻	8070*⁻	12800*⁻	16300*⁻
	ANTIMONY	15	1	2.57*	LT 1	LT 1	LT 1	LT 1
	ARSENIC	14.5	8.86	18.6	14.6	16.1	13.1*	18.8
	BARIUM	247.1	134	163*	99.3*⁻	76.5*⁻	104*⁻	150*
	BERYLLIUM	1.455	0.82	0.775*⁻	0.625*⁻	LT 0.427	0.655*⁻	0.881*
	CADMIUM	0.847	1.2	7.04	2.36	1.87	4.14	1.77
	CALCIUM	114483	35548	11900*⁻	7610*⁻	7000*⁻	31200*⁻	13000*⁻
	CHROMIUM	20.62	22.6	105	23.2	17.5*⁻	37.6	22.4⁻
	COBALT	6.94	7.99	5.12*⁻	3.56*⁻	3.86*⁻	5.32*⁻	6.16*⁻
	COPPER	24.72	17.24	129	52.7	38.3	81.3	39.1
	IRON	22731	17400	17800*	13300*⁻	9910*⁻	15500*⁻	18700*
	LEAD	32.49	73.3	664	163	118	193	103
	MAGNESIUM	13114	6311	7180*	5370*⁻	3980*⁻	8090*	8420*
	MANGANESE	698.3	499	243*⁻	278*⁻	216*⁻	227*⁻	462*⁻
	MERCURY	0.0572	0.07	0.22	0.0996	0.0903	0.124	0.0635⁻
	NICKEL	17.4	14.8	14.7*⁻	11.5*⁻	8.32*⁻	16.7*	13.4*⁻
	POTASSIUM	5449	3259	3800*	3390*	2410*⁻	3430*	5000*
	SODIUM	632	282	473*	497*	363*	339*	730
	VANADIUM	28.39	24.3	22.2*⁻	16.8*⁻	12.8*⁻	22.7*⁻	22.8*⁻
	ZINC	102.8	127	518	190	142	304	178
SEMIVOLATILES	CHRYSENE	N/A	N/A	LT 2	LT 0.3	LT 0.3	LT 0.6	0.12
	FLUORANTHENE	N/A	N/A	LT 2	LT 0.3	LT 0.3	LT 0.6	0.049
PESTICIDES/PCBS	ALPHA CHLORDANE	N/A	N/A	0.14	0.12	0.12	0.053	ND 0.04
	CHLORDANE	N/A	N/A	1.8	1.5	1.6	LT 0.68	LT 0.68
	DDD	N/A	N/A	0.08	LT 0.027	LT 0.027	0.092	0.041
	DDT	N/A	N/A	0.071	LT 0.035	LT 0.035	0.079	0.041
	DIELDRIN	N/A	N/A	0.27	0.027	0.031	LT 0.016	LT 0.016
	ENDRIN	N/A	N/A	0.081	0.078	0.077	LT 0.065	LT 0.065
	ENDRIN ALDEHYDE	N/A	N/A	0.0075	ND 0.005	ND 0.005	ND 0.005	ND 0.005
	GAMMA-CHLORDANE	N/A	N/A	0.18	0.14	0.15	0.066	ND 0.04

Table 5-6. Summary of Soil Sample Analytical Results for the Stormwater Discharge (SWMU 45) (continued)

Test Name	Analytes	TEAD UBC	RSA UBC	ES2-94-05	ES2-94-06
CYANIDE	CYANIDE	5	0.25	LT 0.25	LT 0.25
DIOXINS	OCTACHLORODIBENZODIOXIN	N/A	N/A	LT 0.0000536	LT 0.0000538
METALS	ALUMINUM	28083	17300	7670*-	9320*-
	ANTIMONY	15	1	LT 1	LT 1
	ARSENIC	14.5	8.86	49	18.4
	BARIUM	247.1	134	83.2*-	99*-
	BERYLLIUM	1.455	0.82	LT 0.427	LT 0.427
	CADMIUM	0.847	1.2	1.31	LT 1.2
	CALCIUM	114483	35548	39300*	38500*
	CHROMIUM	20.62	22.6	12.9*-	13.1*-
	COBALT	6.94	7.99	2.91*-	2.96*-
	COPPER	24.72	17.24	23.6*	21.8*
	IRON	22731	17400	10000*-	10400*-
	LEAD	32.49	73.3	87.4	61.2-
	MAGNESIUM	13114	6311	5680*-	5520*-
	MANGANESE	698.3	499	307*-	287*-
	MERCURY	0.0572	0.07	LT 0.05	LT 0.05
	NICKEL	17.4	14.8	8.07*-	8.96*-
	POTASSIUM	5449	3259	2330*-	2970*-
	SODIUM	632	282	132*-	177*-
	VANADIUM	28.39	24.3	13.8*-	14.6*-
	ZINC	102.8	127	117-	89.4*-

Table 5-6. Summary of Soil Sample Analytical Results for the Stormwater Discharge (SWMU 45) (continued)

Test Name	Analytes	TEAD UBC	RSA UBC	ES2-94-05	ES2-94-06
SEMIVOLATILES	CHRYSENE	N/A	N/A	LT 0.032	LT 0.032
	FLUORANTHENE	N/A	N/A	LT 0.032	LT 0.032
PESTICIDES/PCBS	ALPHA CHLORDANE	N/A	N/A	ND 0.04	ND 0.04
	CHLORDANE	N/A	N/A	LT 0.68	LT 0.68
	DDD	N/A	N/A	LT 0.027	LT 0.027
	DDT	N/A	N/A	LT 0.035	LT 0.035
	DIELDRIN	N/A	N/A	LT 0.016	LT 0.016
	ENDRIN	N/A	N/A	LT 0.065	LT 0.065
	ENDRIN ALDEHYDE	N/A	N/A	ND 0.005	ND 0.005
	GAMMA-CHLORDANE	N/A	N/A	ND 0.04	ND 0.04

Note.—All values in $\mu g/g$ (equal to ppm).

N/A=Not Applicable.

*=Analyte concentration is less than TEAD UBC.

~=Analyte concentration is less than RSA UBC.

LT=Analyte concentration is less than Certified Reporting Limit.

ND=Analyte not detected in sample.

(D)=Duplicate analysis.

Alpha and gamma chlordane, dieldrin, p,p-DDT, and p,p-DDD were also detected during the previous RFI at very similar low concentrations.

Explosives

As with the previous RFI, no explosive compounds were detected in the current surface soil samples from SWMU 45.

SVOCs

Chrysene and fluoranthene were detected in only one sample, ES2-94-04 at 0.12 μg/g and 0.049 μg/g, respectively. No SVOCs were detected in soils/sediments during the previous RFI.

5.2.2 Biota Sample Results

Five rabbitbrush samples (EB2-94-02 through EB2-94-06), three sweetclover samples (EC2-94-03, -05, and -06), and three gumweed samples (EM2-94-01, -02, and -04) were collected and analyzed for selected COPCs at SWMU 45. In addition, one kochia sample (EK2-94-01) was collected but was not chemically analyzed due to the small amount of material and a lack of material for comparison at the RSA. Sixteen jackrabbit samples (EJ1-94-01 through EJ1-94-09 and EJ2-94-01 through EJ2-94-06) plus EJ1-94-01 duplicate were analyzed at this SWMU. Four *composite* grasshopper samples (EG1-95-01C through EG1-95-04C) and two *composite* beetle samples (EL1-95-01C and EL1-95-02C) were collected at SWMUs 42 and 45. Analytical results are summarized in Tables 5-7 through 5-9.

Inorganics

Fourteen metals were detected in rabbitbrush samples collected at SWMU 45. Aluminum, ranging from 21.8 to 45.9 ppm, was detected in four of the five samples. Arsenic was also detected in four samples at concentrations ranging from 0.29 to 0.41 ppm (all "B" qualified). Barium (2.8 ("B") to 4.2 ppm), cadmium (0.14 to 0.34 ppm), chromium (0.17 ("B") to 0.21 ppm), copper (4.0 to 5.3 ppm), iron (29.2 to 58.4 ppm), manganese (10.2 to 23.8 ppm ("B")), nickel (0.39 ("B") to 1.3 ppm), lead (0.86 to 1.8 ppm), and zinc (9.0 to 14.3 ppm) were detected in all five rabbitbrush samples. Mercury was detected in two samples (EB2-94-02 and EB2-94-04) at concentrations of 0.01 and 0.02 ppm, respectively. Vanadium was detected only in sample EB2-94-05 at 0.09 ppm ("B"). Cobalt was detected in sample EB2-94-05 at a concentration of 0.1 ppm ("B").

The sweetclover samples contained a total of 13 metals. Aluminum (19.4 to 22.2 ppm), barium (10.8 to 19.2 ppm), chromium (0.19 ("B") to 0.23 ppm), copper (1.7 to 2.1 ppm), iron (23.8 to 30.2 ppm), mercury (0.01 ppm in all three samples), manganese (5.1 to 13.5 ppm), nickel (0.30 to 0.46 ppm) (all "B" qualified), lead (0.64 to 1.0 ppm), and zinc (1.9 to

Table 5-7. Summary of Biota Sample Metal Results for the Stormwater Discharge (SWMU 45)

Test Name	Analytes	RSA Cterm	Gumweed EM2-94-01	Gumweed EM2-94-02	Gumweed EM2-94-04
METALS	ALUMINUM	199.3	ND 80.6	148 *	ND 80.278
	ARSENIC	0.315	ND 0.63	0.73	ND 0.63
	BARIUM	19.2	11.2 *	15.4 *	13.7 *
	CADMIUM	0.5765	2.3	ND 0.402	ND 0.41
	CHROMIUM	0.4501	0.28 *	0.35 *	0.31 *
	COBALT	0.0879	ND 0.078	0.08 *	0.09
	COPPER	9.705	9.6 *	9.9	9.1 *
	IRON	176.2	62.5 *	129 *	87 *
	LEAD	1.428	1.9	2.4	2.2
	MANGANESE	39.97	6.3 *	25.6 *	28.1 *
	NICKEL	2.293	0.45 *	0.52 *	0.4 *
	SELENIUM	0.4039	0.85	ND 0.5588	ND 0.57
	VANADIUM	0.2452	ND 0.108	0.17 *	ND 0.1076
	ZINC	21.31	39.3	33.5	24.2

Test Name	Analytes	RSA Cterm	Rabbitbrush EB2-94-02	Rabbitbrush EB2-94-03	Rabbitbrush EB2-94-04	Rabbitbrush EB2-94-05	Rabbitbrush EB2-94-06
METALS	ALUMINUM	106.6	45.9 *	ND 18.921	21.8 *	26.6 *	27.1 *
	ARSENIC	0.241	0.36	ND 0.2476	0.41	0.29	0.34
	BARIUM	4.672	3.7 *	2.8 *	4.2 *	3.7 *	3.9 *
	CADMIUM	0.3042	0.22 *	0.34	0.22 *	0.14 *	0.21 *
	CHROMIUM	0.2775	0.19 *	0.17 *	0.19 *	0.21 *	0.19 *
	COBALT	0.048	ND 0.095	ND 0.0941	ND 0.0947	0.1	ND 0.0945
	COPPER	4.815	4.1 *	4 *	4.2 *	5.3	4.8 *
	IRON	103.5	58.4 *	29.2 *	37.5 *	40.9 *	39.6 *
	LEAD	1.631	1.8	0.86 *	1.2 *	0.88 *	1.2 *
	MANGANESE	33.68	10.2 *	14.6 *	19 *	23.8 *	13.1 *
	MERCURY	0.0134	0.01 *	ND 0.0099	0.02	ND 0.01	ND 0.0099
	NICKEL	0.6769	0.39 *	0.45 *	1.3	0.81	0.63 *
	VANADIUM	0.126	ND 0.0792	ND 0.0784	ND 0.0789	0.09 *	ND 0.0787
	ZINC	12.19	12.7	14.3	11.4 *	9 *	13.4

Table 5-7. Summary of Biota Sample Metal Results for the Stormwater Discharge (SWMU 45) (continued)

Test Name	Analytes	RSA Cterm	Grasshopper EG1-95-01C	Grasshopper EG1-95-02C	Grasshopper EG1-95-03C
METALS	ALUMINUM	62.43	13.7 *	16.3 *	16 *
	BARIUM	1.994	1.1 *	1.4 *	1.5 *
	CADMIUM	0.5006	0.29 *	0.33 *	0.36 *
	CHROMIUM	0.3676	0.2 *	0.22 *	0.17 *
	COPPER	21.21	22	21.5	24.2
	IRON	79.76	29.4 *	33.9 *	34 *
	LEAD	0.523	0.38 *	0.36 *	0.57
	MERCURY	0.	0.01	0.01	0.01
	NICKEL	0.5127	0.75	0.79	0.78
	SELENIUM	0.2014	0.13 *	0.19 *	0.12 *
	ZINC	57.77	58.8	60.5	59

Test Name	Analytes	RSA Cterm	Jackrabbit EJ1-94-01	Jackrabbit EJ1-94-01 DUP	Jackrabbit EJ1-94-02	Jackrabbit EJ1-94-03	Jackrabbit EJ1-94-04	Jackrabbit EJ1-94-05	Jackrabbit EJ1-94-06
METALS	ALUMINUM	56.46	19.1 *	18.5474 *	26.7 *	20.8 *	13.1 *	17.3 *	21.7 *
	ANTIMONY	0.5876	ND 0.4393	ND 0.4393	ND 0.4273	0.67	ND 0.4476	ND 0.4393	ND 0.4273
	BARIUM	9.97	4.5 *	ND 4.4223	ND 4.3874	4.5 *	4.6 *	ND 4.4048	8.2 *
	BERYLLIUM	0.002	NV	0.0055	NV	NV	ND 0.004	NV	NV
	CADMIUM	0.0839	ND 0.12	ND 0.12	0.13	ND 0.1188	ND 0.1165	0.13	0.14
	CHROMIUM	0.4221	0.39 *	0.456	0.44	0.35 *	0.39 *	0.34 *	0.43
	COBALT	0.0402	ND 0.0538	ND 0.0538	ND 0.0534	ND 0.0536	ND 0.0536	ND 0.0536	0.06
	COPPER	2.646	25.7	25.2374	9.8	23.6	11.5	3.7	3.6
	IRON	116.5	129	127.712	93.8 *	133	97.2 *	112 *	74.9 *
	LEAD	20.68	50.3	46.7211	1.8 *	104	76.1	65.9	2 *
	MANGANESE	3.53	2.7 *	2.624 *	4.2	4.1	2.1 *	2.2 *	3.9
	MERCURY	0.0136	0.01 *	0.0057 *	0.01 *	0.01 *	0.0029 *	0.01 *	0.01 *
	NICKEL	0.1302	0.28	0.2382	0.23	0.27	0.12 *	0.2	0.22
	ZINC	21.53	24.1	23.7683	24.1	22.1	20.8 *	20.8 *	23.8

Table 5-7. Summary of Biota Sample Metal Results for the Stormwater Discharge (SWMU 45) (continued)

Test Name	Analytes	RSA Cterm	Sweetclover EC2-94-03	Sweetclover EC2-94-05	Sweetclover EC2-94-06
METALS	ALUMINUM	40.95	19.7 *	22.2 *	19.4 *
	ARSENIC	0.2804	ND 0.2804	0.43	ND 0.297
	BARIUM	15.43	10.8 *	12.6 *	19.2
	CADMIUM	0.082	0.19	ND 0.1287	ND 0.1287
	CHROMIUM	0.2522	0.21 *	0.19 *	0.23 *
	COBALT	0.0958	0.09 *	ND 0.0709	ND 0.0711
	COPPER	5.9	2.1 *	1.9 *	1.7 *
	IRON	47.33	27.3 *	30.2 *	23.8 *
	LEAD	0.5018	0.87	1	0.64
	MANGANESE	11.2	5.1 *	9.2 *	13.5
	MERCURY	0.0121	0.01 *	0.01 *	0.01 *
	NICKEL	0.634	0.34 *	0.46 *	0.3 *
	ZINC	6.422	4.8 *	1.9 *	2.4 *

Test Name	Analytes	RSA Cterm	Beetle EL1-95-01C	Beetle EL1-95-02C
METALS	ALUMINUM	194.	117 *	69.2 *
	ANTIMONY	0.21	0.59	ND 0.1944
	ARSENIC	0.48	2.3	2.8
	BARIUM	2.6	5.7	3.5
	CADMIUM	0.15	0.44	0.28
	CHROMIUM	0.43	0.48	0.36 *
	COBALT	0.15	0.15	0.12 *
	COPPER	5.7	12.2	8.4
	IRON	213.	148 *	94.7 *
	LEAD	0.48	3.9	2.5
	MANGANESE	10.4	11.3	9.2 *
	MERCURY	0.01	0.03	0.02
	NICKEL	1.	0.88 *	0.48 *
	SELENIUM	0.13	0.17	0.17
	VANADIUM	0.31	0.24 *	0.17 *
	ZINC	43.2	56.9	53.5

Table 5-7. *Summary of Biota Sample Metal Results for the Stormwater Discharge (SWMU 45) (continued)*

Test Name	Analytes	RSA Cterm	Jackrabbit EJ1-94-07	Jackrabbit EJ1-94-08	Jackrabbit EJ1-94-09	Jackrabbit EJ2-94-01	Jackrabbit EJ2-94-02	Jackrabbit EJ2-94-03	Jackrabbit EJ2-94-04
METALS	ALUMINUM	56.46	21.4 *	28.1 *	25.6 *	8.6 *	16 *	22 *	19.1 *
	ANTIMONY	0.5876	ND 0.4312	ND 0.4312	ND 0.4608	ND 0.4393	ND 0.4653	0.45 *	ND 0.4273
	BARIUM	9.97	ND 4.4311	4.4 *	ND 4.3874	ND 4.3615	ND 4.4223	ND 4.396	ND 4.3787
	BERYLLIUM	0.002	NV	NV	NV	NV	NV	NV	ND 0.0039
	CADMIUM	0.0839	0.14	0.15	0.2	ND 0.1188	0.42	ND 0.1121	ND 0.1132
	CHROMIUM	0.4221	0.38 *	0.37 *	0.39 *	0.38 *	0.36 *	0.37 *	0.32 *
	COBALT	0.0402	ND 0.0539	ND 0.0533	0.06	ND 0.053	ND 0.0538	ND 0.0535	ND 0.0533
	COPPER	2.646	6.5	4.3	13.8	6.1	12.6	6.1	20.4
	IRON	116.5	75.1 *	118	125	102 *	126	97.8 *	79.9 *
	LEAD	20.68	1.8 *	72.5	19.5 *	17.2 *	2.5 *	30.7	23.8
	MANGANESE	3.53	3.4 *	2.6 *	2.5 *	2.3 *	2.9 *	3.1 *	4.2
	MERCURY	0.0136	0.0029 *	0.01 *	0.01 *	0.01 *	0.01 *	ND 0.0029	0.01 *
	NICKEL	0.1302	0.22	ND 0.09859	0.26	0.15	0.2	0.23	0.29
	ZINC	21.53	21.7	21.5 *	22.5	22.4	22.3	22.7	19.4 *

Test Name	Analytes	RSA Cterm	Jackrabbit EJ2-94-05	Jackrabbit EJ2-94-06
METALS	ALUMINUM	56.46	13.3 *	20.4 *
	ANTIMONY	0.5876	ND 0.4476	ND 0.4434
	BARIUM	9.97	ND 4.3701	ND 4.3701
	BERYLLIUM	0.002	ND 0.0039	NV
	CADMIUM	0.0839	0.16	ND 0.1176
	CHROMIUM	0.4221	0.36 *	0.44
	COBALT	0.0402	ND 0.0531	0.08
	COPPER	2.646	10.3	31.4
	IRON	116.5	87.7 *	188
	LEAD	20.68	405	265
	MANGANESE	3.53	1.9 *	2.8 *
	MERCURY	0.0136	0.01 *	0.01 *
	NICKEL	0.1302	0.38	0.44
	ZINC	21.53	18.9 *	21.4 *

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
*=Analyte concentration is less than Cterm.
NV=Not a Valid Detect.
DUP=Duplicate analysis.

Table 5-8. Summary of Biota Sample Dioxin/Furans Results for the Stormwater Discharge (SWMU 45)

Test Name	Analytes	RSA Cterm	Gumweed EM2-94-01	Gumweed EM2-94-02	Gumweed EM2-94-04
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	1.516	ND 0.49	0.6736 *	1.7762
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.732	ND 0.231	0.4358 *	0.6312 *
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.6295	NV	0.9013	NV
	OCTACHLORODIBENZODIOXIN	2.5	3.911	4.6252	10.5766
	OCTACHLORODIBENZOFURAN	1.11	0.8814 *	ND 0.475	ND 0.65
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.9946	ND 0.49	0.6736 *	3.7915
	TOTAL HEPTACHLORODIBENZOFURANS	0.909	ND 0.287	0.4358 *	0.6312 *
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	1.066	ND 0.3	ND 0.196	0.3799 *
	TOTAL HEXACHLORODIBENZOFURANS	0.3963	0.289 *	0.3172 *	0.338 *
	TOTAL PENTACHLORODIBENZOFURANS	0.4507	0.6186	NV	NV
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.3008	0.1622 *	ND 0.067	0.3371
	TOTAL TETRACHLORODIBENZOFURANS	1.254	0.2868 *	1.7832	0.3547 *

Test Name	Analytes	RSA Cterm	Rabbitbrush EB2-94-02	Rabbitbrush EB2-94-03	Rabbitbrush EB2-94-04	Rabbitbrush EB2-94-05	Rabbitbrush EB2-94-06
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	ND 0.462	ND 0.414	0.3473 *	ND 0.433	ND 0.214
	OCTACHLORODIBENZODIOXIN	4.11	1.9859 *	ND 0.671	NV	NV	NV
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	ND 0.462	ND 0.414	0.7426 *	ND 0.433	ND 0.214
	TOTAL HEXACHLORODIBENZOFURANS	1.145	ND 0.145	ND 0.135	NV	ND 0.135	0.3061 *
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.203	ND 0.089	ND 0.08699	ND 0.045	ND 0.08799	0.2174
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	ND 0.075	ND 0.07099	1.5091	ND 0.07199	0.9879

Test Name	Analytes	RSA Cterm	Sweetclover EC2-94-03	Sweetclover EC2-94-05	Sweetclover EC2-94-06
DIOXIN	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3477	NV	ND 0.393	0.2856 *
	OCTACHLORODIBENZODIOXIN	7.662	20.2687	NV	4.0811 *
	OCTACHLORODIBENZOFURAN	4.013	0.8197 *	ND 1.862	ND 0.846
	TOTAL HEPTACHLORODIBENZOFURANS	2.184	0.3661 *	ND 0.694	ND 0.329
	TOTAL HEXACHLORODIBENZOFURANS	0.9658	0.5917 *	ND 0.387	0.2856 *
	TOTAL TETRACHLORODIBENZOFURANS	0.3733	0.5486	ND 0.192	0.2499 *

Table 5-8. *Summary of Biota Sample Dioxin/Furans Results for the Stormwater Discharge (SWMU 45) (continued)*

Test Name	Analytes	RSA Cterm	Jackrabbit EJ1-94-06	Jackrabbit EJ1-94-07	Jackrabbit EJ1-94-08	Jackrabbit EJ1-94-09	Jackrabbit EJ2-94-01	Jackrabbit EJ2-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.5615	13.4515	30.7081	2.0388	2.2626	0.9804	9.63
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.208	3.4994	10.304	ND 0.142	ND 0.131	0.3702	2.3801
	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	0.624	ND 0.217	ND 0.19	ND 0.223	ND 0.206	ND 0.068	0.3321 *
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.4905	0.2695 *	0.6264	ND 0.227	ND 0.222	ND 0.082	0.1801 *
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3195	0.3477	ND 0.128	0.2605 *	ND 0.142	0.1408 *	0.6098
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.403	0.7582	1.1046	ND 0.21	ND 0.205	ND 0.069	0.5274
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.24	0.2989	ND 0.094	ND 0.103	ND 0.104	0.09329 *	0.2746
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.354	0.5969	0.8691	ND 0.2	ND 0.196	0.1013 *	0.3167 *
	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	0.4885	ND 0.15	ND 0.136	ND 0.155	ND 0.168	ND 0.062	0.1163 *
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3015	0.4559	0.833	0.4214	0.4578	0.2336 *	0.7589
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.3025	ND 0.09	ND 0.082	ND 0.093	ND 0.096	ND 0.038	0.197 *
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.233	ND 0.083	ND 0.074	ND 0.08	ND 0.08799	ND 0.038	0.1128 *
	OCTACHLORODIBENZODIOXIN	0.5084	61.5345	150.278	3.2721	5.3438	2.4013	20.9506
	OCTACHLORODIBENZOFURAN	0.7395	7.1458	12.5488	ND 0.396	ND 0.344	ND 0.08699	2.6302
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.5615	13.4515	31.231	2.0388	2.2626	0.9804	9.8317
	TOTAL HEPTACHLORODIBENZOFURANS	0.2521	4.405	10.304	ND 0.174	ND 0.16	0.4713	2.9413
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.4085	1.6245	2.6002	ND 0.212	ND 0.207	0.1013 *	1.0243
	TOTAL HEXACHLORODIBENZOFURANS	0.1651	1.1025	0.833	0.6819	0.4578	0.4677	1.6433
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.4885	ND 0.15	ND 0.136	ND 0.155	ND 0.168	ND 0.062	0.1163 *
	TOTAL PENTACHLORODIBENZOFURANS	0.1556	ND 0.093	ND 0.084	ND 0.096	ND 0.099	ND 0.039	0.197
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.28	ND 0.108	ND 0.101	ND 0.115	ND 0.119	ND 0.044	0.0554 *
	TOTAL TETRACHLORODIBENZOFURANS	0.2096	ND 0.083	ND 0.074	ND 0.08	ND 0.08799	ND 0.038	0.1128 *

Table 5-8. Summary of Biota Sample Dioxin/Furans Results for the Stormwater Discharge (SWMU 45) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL1-95-01C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.305	7.8251
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.259	1.0495
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.4855	0.293 *

Test Name	Analytes	RSA Cterm	Grasshopper EG1-95-01C	Grasshopper EG1-95-02C	Grasshopper EG1-95-03C
DIOXIN	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.7685	NV	NV	0.7136 *
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.582	ND 0.245	0.1138 *	ND 0.15
	TOTAL HEXACHLORODIBENZOFURANS	0.3216	0.2974 *	ND 0.27	0.2959 *

Test Name	Analytes	RSA Cterm	Jackrabbit EJ1-94-01	Jackrabbit EJ1-94-01 DUP	Jackrabbit EJ1-94-02	Jackrabbit EJ1-94-03	Jackrabbit EJ1-94-04	Jackrabbit EJ1-94-05
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.5615	2.1578	2.2024	7.8712	6.9356	2.2396	0.5532 *
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.208	ND 0.12	ND 0.169	0.9044	ND 0.513	0.4948	0.222
	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	0.624	ND 0.188	ND 0.266	ND 0.388	ND 0.791	ND 0.166	ND 0.101
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.4905	ND 0.207	ND 0.29	ND 0.309	ND 0.534	ND 0.192	ND 0.101
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3195	ND 0.123	ND 0.171	ND 0.21	ND 0.364	ND 0.105	ND 0.064
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.403	ND 0.191	0.2213 *	0.5985	ND 0.439	0.4473	ND 0.093
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.24	ND 0.09	ND 0.126	ND 0.158	ND 0.274	ND 0.077	ND 0.047
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.354	ND 0.183	ND 0.256	ND 0.223	ND 0.386	ND 0.17	ND 0.089
	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	0.4885	ND 0.241	ND 0.225	ND 0.237	ND 0.413	ND 0.127	ND 0.084
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3015	0.3595	NV	ND 0.198	ND 0.344	0.2384 *	0.156 *
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.3025	ND 0.095	ND 0.128	ND 0.16	ND 0.268	ND 0.074	ND 0.046
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.233	ND 0.08	ND 0.105	ND 0.138	ND 0.219	ND 0.102	ND 0.077
	OCTACHLORODIBENZODIOXIN	0.5084	4.4756	4.8033	13.1298	14.4233	5.6626	1.5333
	OCTACHLORODIBENZOFURAN	0.7395	0.6947 *	0.7398	ND 0.497	ND 0.927	ND 0.257	ND 0.15
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.5615	2.1578	2.2024	7.8712	6.9356	2.6202	0.5532 *
	TOTAL HEPTACHLORODIBENZOFURANS	0.2521	0.2151 *	0.1886 *	0.9044	ND 0.623	0.8517	0.222 *
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.4085	ND 0.193	0.2213 *	0.5985	ND 0.445	0.4473	ND 0.094
	TOTAL HEXACHLORODIBENZOFURANS	0.1651	0.3595	ND 0.16	ND 0.192	ND 0.332	0.2384	0.156 *
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.4885	ND 0.241	ND 0.225	ND 0.237	ND 0.413	ND 0.127	ND 0.084
	TOTAL PENTACHLORODIBENZOFURANS	0.1556	ND 0.098	ND 0.132	ND 0.159	ND 0.267	ND 0.077	ND 0.047
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.28	ND 0.094	ND 0.131	ND 0.164	ND 0.259	ND 0.089	ND 0.054
	TOTAL TETRACHLORODIBENZOFURANS	0.2096	ND 0.08	ND 0.105	ND 0.138	ND 0.219	ND 0.102	ND 0.077

Table 5-8. *Summary of Biota Sample Dioxin/Furans Results for the Stormwater Discharge (SWMU 45) (continued)*

Test Name	Analytes	RSA Cterm	Jackrabbit EJ2-94-03	Jackrabbit EJ2-94-04	Jackrabbit EJ2-94-05	Jackrabbit EJ2-94-06
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.5615	1.0081	1.484	4.4966	10.7802
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.208	0.2927	ND 0.098	ND 0.173	3.1271
	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	0.624	ND 0.152	ND 0.154	ND 0.272	ND 0.143
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.4905	ND 0.16	ND 0.156	ND 0.25	ND 0.17
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3195	0.1359 *	ND 0.101	ND 0.16	0.3376
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.403	ND 0.148	ND 0.144	ND 0.231	ND 0.157
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.24	ND 0.073	ND 0.074	ND 0.118	0.2971
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.354	ND 0.142	ND 0.138	ND 0.221	ND 0.15
	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	0.4885	ND 0.116	ND 0.11	ND 0.164	ND 0.127
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3015	NV	NV	0.362	0.4018
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.3025	ND 0.068	ND 0.066	ND 0.093	ND 0.07199
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.233	ND 0.058	ND 0.062	ND 0.07099	ND 0.062
	OCTACHLORODIBENZODIOXIN	0.5084	2.7193	3.829	191.276	31.8276
	OCTACHLORODIBENZOFURAN	0.7395	ND 0.362	ND 0.262	3.2061	3.0256
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.5615	1.0081	1.484	7.4846	10.7802
	TOTAL HEPTACHLORODIBENZOFURANS	0.2521	0.2927	ND 0.12	2.6878	3.1271
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.4085	ND 0.15	ND 0.146	ND 0.233	ND 0.159
	TOTAL HEXACHLORODIBENZOFURANS	0.1651	0.1359 *	ND 0.094	NV	1.0365
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.4885	ND 0.116	ND 0.11	ND 0.164	ND 0.127
	TOTAL PENTACHLORODIBENZOFURANS	0.1556	ND 0.07	ND 0.068	NV	ND 0.075
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.28	ND 0.082	ND 0.079	ND 0.1	ND 0.08799
	TOTAL TETRACHLORODIBENZOFURANS	0.2096	ND 0.058	ND 0.062	NV	ND 0.062

Note.—All values in ng/kg (equal to ppt).
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
NV=Not a Valid Detect.
*=Analyte concentration is less than Cterm.
DUP=Duplicate analysis.

Table 5-9. Summary of Remaining Biota Sample Analytical Results for the Stormwater Discharge (SWMU 45)

Test Name	Analytes	RSA Cterm	Gumweed EM2-94-01	Gumweed EM2-94-02	Gumweed EM2-94-04
PAH	CHRYSENE	0.345	ND 0.68999	ND 0.68999	1.2
	FLUORANTHENE	1.8	4.8	3.9	5.3
	PHENANTHRENE	9.39	24	21	26
	PYRENE	0.9	2.5	1.9	2.8

Test Name	Analytes	RSA Cterm	Rabbitbrush EB2-94-02	Rabbitbrush EB2-94-03	Rabbitbrush EB2-94-03 DUP	Rabbitbrush EB2-94-04	Rabbitbrush EB2-94-05	Rabbitbrush EB2-94-06
HERBICIDE	2,4-D	750.	ND 1500	ND 1500	ND 1500	ND 1500	2000	2000
PAH	CHRYSENE	0.5024	ND 0.83	ND 0.83	NS	ND 0.83	ND 0.83	1.3
	FLUORANTHENE	2.227	4.3	4.4	NS	6	5.3	7.8
	PHENANTHRENE	7.8	32	32	NS	37	45	47
	PYRENE	0.78	1.2	1.1	NS	1.7	1.2	2.3

Test Name	Analytes	RSA Cterm	Sweetclover EC2-94-03	Sweetclover EC2-94-05	Sweetclover EC2-94-06
EXPLOSIVES	2,4,6-TRINITROTOLUENE	139.2	ND 220	ND 220	2500
	RDX	492.	5900	ND 400	3800
PAH	FLUORANTHENE	0.8689	2.5	0.95	1.3
	PHENANTHRENE	3.123	6.4	3.9	3.8
	PYRENE	0.3947	0.98	0.35 *	0.54

Test Name	Analytes	RSA Cterm	Beetle EL1-95-01C	Beetle EL1-95-02C
PESTICIDES	DDE	5.5	20	43
	DDT	0.215	14	7.8

Test Name	Analytes	RSA Cterm	Grasshopper EG1-95-01C	Grasshopper EG1-95-02C	Grasshopper EG1-95-03C
PESTICIDES	DDE	0.5	1.7	1.1	ND 0.86
	DDT	0.4759	ND 0.43	1.2	ND 0.43

Table 5-9. Summary of Remaining Biota Sample Analytical Results for the Stormwater Discharge (SWMU 45) (continued)

Test Name	Analytes	RSA Cterm	Jackrabbit EJ1-94-01	Jackrabbit EJ1-94-01 DUP	Jackrabbit EJ1-94-02	Jackrabbit EJ1-94-03	Jackrabbit EJ1-94-04	Jackrabbit EJ1-94-05
PAH	BENZO [A] ANTHRACENE	0.245	ND 0.49	ND 0.49	ND 0.49	ND 0.49	ND 0.49	0.79
	BENZO [K] FLUORANTHENE	0.25	ND 0.5	ND 0.5	ND 0.5	ND 0.5	ND 0.5	1.8
	CHRYSENE	0.28	ND 0.56	ND 0.56	1.7	0.59	1.1	1.8
	FLUORANTHENE	0.43	ND 0.86	ND 0.86	ND 0.86	ND 0.86	ND 0.86	0.88
	PHENANTHRENE	0.185	1	1.3	1.3	NV	ND 0.86	1.4
	PYRENE	0.195	0.63	0.7	1.2	NV	NV	0.86
PESTICIDES	DDE	0.7335	0.71 *	1.1	ND 0.67	0.8	NV	ND 0.67
						ND 0.67	ND 0.67	

Test Name	Analytes	RSA Cterm	Jackrabbit EJ1-94-06	Jackrabbit EJ1-94-07	Jackrabbit EJ1-94-08	Jackrabbit EJ1-94-09	Jackrabbit EJ2-94-01	Jackrabbit EJ2-94-02
PAH	BENZO [A] ANTHRACENE	0.245	2.1	1.3	ND 0.49	ND 0.49	ND 0.49	3.1
	BENZO [K] FLUORANTHENE	0.25	1.5	1	ND 0.5	ND 0.5	ND 0.5	3.1
	CHRYSENE	0.28	4.2	1.9	ND 0.56	1.2	ND 0.56	6.5
	FLUORANTHENE	0.43	4.8	4.5	ND 0.86	1.3	ND 0.86	7.7
	PHENANTHRENE	0.185	3.9	4.5	1.1	1.5	1	3.8
	PYRENE	0.195	5.5	5.1	0.44	1.4	ND 0.39	8.9
PESTICIDES	DDE	0.7335	ND 0.67	0.82	ND 0.67	ND 0.67	ND 0.67	ND 0.67

Test Name	Analytes	RSA Cterm	Jackrabbit EJ2-94-03	Jackrabbit EJ2-94-04	Jackrabbit EJ2-94-05	Jackrabbit EJ2-94-06
PAH	BENZO [A] ANTHRACENE	0.245	ND 0.49	ND 0.49	ND 0.49	ND 0.49
	BENZO [K] FLUORANTHENE	0.25	ND 0.5	ND 0.5	ND 0.5	ND 0.5
	CHRYSENE	0.28	0.91	ND 0.56	0.74	ND 0.56
	FLUORANTHENE	0.43	ND 0.86	0.9	1.3	ND 0.86
	PHENANTHRENE	0.185	1.3	2.4	1.1	0.72
	PYRENE	0.195	0.83	0.56	1.3	ND 0.39
PESTICIDES	DDE	0.7335	ND 0.67	ND 0.67	1.2	ND 0.67

Note.—All values in μg/kg (equal to ppb).
PAH=Polynuclear Aromatic Hydrocarbon.
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
DUP=Duplicate analysis.
NS=Matrix not sampled at this location.
*=Analyte concentration is less than Cterm.
NV=Not a Valid Detect.

4.8 ppm) were detected in all three sweetclover samples. Arsenic was detected only in sample EC2-94-05 at a concentration of 0.43 ppm ("B"). Cadmium was detected only in samples EC2-94-03 at a concentration of 0.19 ppm ("B"). Cobalt was detected only in sample EC2-94-03 at a concentration of 0.09 ppm ("B").

Results for the three gumweed samples show that samples EM2-94-01 contained 12 metals; EM2-94-02 contained 14 metals; and EM2-94-04 contained 11 metals above detection limits. Aluminum (148 ppm), arsenic (0.73 ppm ("B")), and vanadium (0.17 ppm ("B")) were detected only in sample EM2-94-02. Cadmium, at a concentration of 2.3 ppm, was detected only in sample EM2-94-01. Selenium was detected only in sample EM2-94-01 at a concentration of 0.85 ppm. Cobalt was detected in two samples (EM2-94-02 and -04) at concentrations of 0.08 and 0.09 ppm, respectively (both "B" qualified). The remaining nine metals were found in all three samples, including barium (11.2 to 15.4 ppm), chromium (0.28 to 0.35 ppm), copper (9.1 to 9.9 ppm), iron (62.5 to 129 ppm), manganese (6.3 to 28.1 ppm), nickel (0.40 to 0.52 ppm (all "B" qualified)), lead (1.9 to 2.4 ppm), and zinc (24.2 to 39.3 ppm).

Results for the 16 jackrabbit samples show that 1 sample contained 12 metals; 2 samples contained 11 metals; 10 samples contained 10 metals; and 3 samples contained 9 metals above detection limit. Antimony was detected in only two samples, EJ1-94-03 and EJ2-94-03, at 0.67 ("B") and 0.45 ppm ("B"), respectively. Barium was detected in 5 of the 16 jackrabbit samples, ranging from 4.4 to 8.2 ppm. Beryllium was detected only in sample EJ1-94-01 duplicate at a concentration of 0.0055 ppm ("B"). Cadmium was detected in 8 of 16 samples with concentrations ranging from 0.13 to 0.42 ppm (all "B" qualified). Cobalt was only detected in three samples—EJ1-94-06, -09, and EJ2-94-06—at 0.06, 0.06, and 0.08 ppm, respectively (all values "B" qualified). Mercury was detected in 15 samples ranging from 0.0029 ("B") to 0.01 ppm. Nickel was present in 15 of the 16 samples with concentrations ranging from 0.12 to 0.44 ppm (all values "B" qualified). The remaining 7 metals, detected in all 16 jackrabbit samples, included aluminum (8.6 to 28.1 ppm), chromium (0.32 to 0.46 ppm), copper (3.6 to 31.4 ppm), iron (75 to 188 ppm), manganese (2.1 to 4.2 ppm), lead (1.8 to 405 ppm), and zinc (18.9 to 24.1 ppm).

Refer to Section 5.1.2, SWMU 42 Biota Sample Results, for grasshopper and beetle sample analysis discussion.

Dioxins/Furans

Rabbitbrush sample EB2-94-02 reported a value of 1.99 ppt for OCDD. Sample EB2-94-04 had detectable quantities of 1234678-HpCDD (0.35 ppt), total HpCDD (0.74 ppt), and total TCDF (1.51 ppt). Sample EB2-94-06 had detectable quantities of total HxCDF (0.31 ppt), total TCDD (0.22 ppt), and total TCDF (0.99 ppt).

SWMU 45 sweetclover sample EC2-94-03 had detectable quantities of OCDD (20.27 ppt), OCDF (0.82 ppt), total HpCDFs (0.37 ppt), total HxCDFs (0.59 ppt), and total TCDF (0.55

ppt). Similarly, sample EC2-94-06 reported 234678-HxCDF at 0.29 ppt, OCDD at 4.08 ppt, total HxCDFs at 0.29 ppt, and total TCDF at 0.25 ppt.

The compound OCDD was reported in the three gumweed samples (EM2-94-01, -02, and -04) with a range of 3.91 to 10.58 ppt. Similarly, the following compounds were detected in all three samples: total HxCDF (0.29 to 0.34 ppt) and total TCDF (0.29 to 1.78 ppt). Sample EM2-94-01 additionally reported OCDF (0.88 ppt), total PeCDF (0.62 ppt), and total TCDD (0.16 ppt). Sample EM2-94-02 also had detectable quantities of 1234678-HpCDD (0.67 ppt), 1234678-HpCDF (0.44 ppt), 2378-TCDF (0.90 ppt), total HpCDD (0.67 ppt), and total HpCDF (0.44 ppt). Gumweed sample EM2-94-04 had reportable quantities of total HpCDD (3.79 ppt), 1234678-HpCDD (1.78 ppt), 1234678-HpCDF (0.63 ppt), total HpCDF (0.63 ppt), total HxCDD (0.38 ppt), and total TCDD (0.34 ppt).

The compound 1234678-HpCDD was detected in all 16 jackrabbit samples with values ranging from 0.55 to 30.71 ppt. Nine samples (EJ1-94-02, -04, -05, -06, -07, EJ2-94-01, -02, -03, and -06) had detectable quantities of 1234678-HpCDF, ranging from 0.22 to 10.3 ppt. Three jackrabbit samples had detectable quantities of 123478-HxCDD, EJ1-94-06, 07, and EJ2-94-02, with a range of 0.18 to 0.63 ppt. Six jackrabbit samples (EJ1-94-06, -08, EJ2-94-01, -02 -03, and -06) had detectable quantities of 123478-HxCDF, ranging from 0.14 to 0.61 ppt. Six samples (EJ1-94-01dup, -02, -04, -06, -07, and EJ2-94-02) had detectable quantities of 123678-HxCDD, ranging from 0.22 to 1.1 ppt. Four samples (EJ1-94-06, EJ2-94-01, -02, and -06) had detectable quantities of 123678-HxCDF, ranging from 0.09 to 0.3 ppt. The compound 123789-HxCDD was detected in four jackrabbit samples as follows: EJ1-94-06 (0.60 ppt), EJ1-94-07 (0.87 ppt), EJ2-94-01 (0.1 ppt), and EJ2-94-02 (0.32 ppt). Eleven samples (EJ1-94-01, -04, -05, -06, -07, -08, -09, EJ2-94-01, -02, -05, and -06) reported quantities of 234678-HxCDF with a range of 0.16 to 0.83 ppt. All 16 samples had detectable quantities of OCDD with a range of 1.53 to 191.28 ppt. Seven samples (EJ1-94-01, -01dup, -06, -07, EJ2-94-02, -05, and -06) had detectable quantities of OCDF, ranging from 0.69 to 12.55 ppt. All 16 samples had detectable quantities of total HpCDD, ranging from 0.55 to 31.23 ppt. Twelve jackrabbit samples (all <u>except</u> EJ1-94-03, -08, -09, and EJ2-94-02) had detectable quantities of total HpCDF, ranging from 0.19 to 10.3 ppt. Seven samples, EJ-94-01dup, -02, -04, -06, -07, EJ2-94-01, and -02, contained quantities of total HxCDD, ranging from 0.1 to 2.6 ppt. A total of 11 of the 16 samples (all <u>except</u> EJ1-94-01dup, -02, -03, EJ2-94-04, and -05) had measurable quantities of total HxCDFs, ranging from 0.14 to 1.64 ppt. Single detects of the following quantities were also reported in jackrabbit sample EJ2-94-02: 12378-PeCDD at 0.12 ppt; 23478-PeCDF at 0.2 ppt; 2378-TCDF at 0.11 ppt; total PeCDD at 0.12 ppt; total PeCDF at 0.2 ppt; total TCDD at 0.06 ppt; and total TCDF at 0.11 ppt.

Refer to Section 5.1.2, SWMU 42 Biota Sample Results, for grasshopper and beetle sample analysis discussion.

<u>Explosives</u>

Explosives were detected in all three sweetclover samples taken at SWMU 45. RDX was

detected in sample EC2-94-03 at 5,900 ppb and in sample EC2-94-06 at 3,800 ppb. The explosive 2,4,6-TNT was also detected at 2,500 ppb in sample EC2-94-06.

Grasshopper/beetle samples were not analyzed for herbicides.

Herbicides

The herbicide 2,4-D was found in two of the five rabbitbrush samples from SWMU 45. A level of 2,000 ppb was reported for both samples EB2-94-05 and EB2-94-06.

Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

Three jackrabbit samples (EJ1-94-01, EJ1-94-07, and EJ2-94-05) and the duplicate for sample EJ1-94-01 had reportable quantities of 4,4'-DDE, ranging from 0.71 to 1.2 ppb.

Refer to Section 5.1.2, SWMU 42 Biota Sample Results, for discussion of grasshopper and beetle analyses.

PAHs

All five rabbitbrush samples at SWMU 45 (EB2-94-02 through -06) had detectable quantities of fluoranthene, phenanthrene, and pyrene. Sample EB2-94-06 also had a detect of chrysene at 1.3 ppb. The values of fluoranthene ranged from 4.3 to 7.8 ppb for the five samples; phenanthrene ranged from 32 to 47 ppb; and pyrene values ranged from 1.1 to 2.3 ppb. All three sweetclover samples (EC2-94-03, -05, and -06) had detectable quantities of fluoranthene (0.95 to 2.5 ppb), phenanthrene (3.8 to 6.4 ppb), and pyrene (0.35 to 0.98 ppb). The three gumweed samples (EM2-94-01, -02, and -04) had detectable quantities of fluoranthene, phenanthrene, and pyrene. EM2-94-04 also reported 1.2 ppb of chrysene. The values for fluoranthene for the three samples ranged from 3.9 to 5.3 ppb; those for phenanthrene ranged from 21 to 26 ppb; while those for pyrene ranged from 1.9 to 2.8 ppb.

All 16 jackrabbit samples (EJ1-94-01 through -09 and EJ2-94-01 through -06), including a duplicate sample for EJ1-94-01, had detectable quantities of various SVOCs. Phenanthrene was detected in 14 of the 16 samples with a range from 0.72 ppb to 4.5 ppb. Pyrene was reported in 13 of the 16 samples with a range from 0.44 to 8.9 ppb. Ten detects were reported for chrysene, ranging from 0.59 to 6.5 ppb. There were seven detects of fluoranthene with values ranging from 0.88 ppb to 7.7 ppb. Four samples (EJ1-94-05, -06, -07, and EJ2-94-02) had detectable quantities of benzo(a)anthracene (ranging from 0.79 ppb to 3.1 ppb) and benzo(k)fluoranthene (ranging from 1.0 to 3.1 ppb). The highest concentrations of all the detected SVOCs except phenanthrene were found in one sample (EJ2-94-02). EJ1-94-07 had the highest concentration of phenanthrene.

Grasshopper/beetle samples were not analyzed for PAHs.

5.3 SWMU 10 - TNT WASHOUT FACILITY

5.3.1 Soil Sample Results

Two surface soil samples (ES5-94-01 and -02) and one duplicate sample (ES5-94-01) were collected at SWMU 10 at selected approximate locations of contamination previously identified by RFI sampling and analysis (Figure 5-3). Previous sampling indicated high levels of explosives in soils. It should be noted, however, that the previous RFI sampling was conducted just below the soil cover and synthetic liner capping the former TNT Washout Ponds; whereas, soil samples collected in the fall of 1994 were entirely within the cover material. The two samples were analyzed for inorganics, dioxins/furans, pesticides/PCBs, explosives, and SVOCs. The results are summarized in Table 5-10.

Inorganics

Metal concentrations in both samples and the duplicate were below the UBCs for TEAD and the RSA for all analytes detected. Of the soil samples analyzed for metals in the previous RFI, cadmium and lead were found to exceed background concentrations in soils below the synthetic liner.

Dioxins/Furans

Sample ES5-94-02 had a positive detection for 1,2,3,4,6,7,8-heptachlorodibenzofuran with a concentration of 0.01 ppb. TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) was detected in both samples at 0.01 ppb but not in the duplicate analysis. Previous RFI samples were not analyzed for dioxins/furans.

Pesticides/PCBs

No pesticides or PCBs were detected.

Explosives

No explosive compounds were detected.

SVOCs

No SVOC compounds were detected.

5.3.2 Biota Sample Results

Two rabbitbrush samples (EB5-94-01 and -02) and two gumweed samples (EM5-94-01 and -02) were collected at SWMU 10. No jackrabbits were collected at this SWMU. See Tables 5-11 through 5-13 for a summary of analyte detections in SWMU 10 biota samples. Four

Table 5-10. Summary of Soil Sample Analytical Results for the TNT Washout Facility (SWMU 10)

Test Name	Analytes	TEAD UBC	RSA UBC	ES5-94-01	ES5-94-01(D)	ES5-94-02
DIOXINS	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	N/A	N/A	LT 0.0000089	LT 0.0000148	0.0000104
	2,3,7,8 TETRACHLORODIBENZODIOXIN	N/A	N/A	0.0000146	LT 0.0000116	0.0000159
METALS	ALUMINUM	28,083.	17,300.	3000*~	3260*~	3990*~
	ARSENIC	14.5	8.86	4.04*~	3.37*~	3.3*~
	BARIUM	247.1	134.	49.3*~	50.6*~	49.8*~
	CALCIUM	114,483.	35,548.	41100*	42300*	21100*~
	CHROMIUM	20.62	22.6	5.27*~	5.79*~	6.61*~
	COPPER	24.72	17.24	3.41*~	3.44*~	6.04*~
	IRON	22,731.	17,400.	5230*~	5650*~	6530*~
	MAGNESIUM	13,114.	6,311.	4130*~	4140*~	3050*~
	MANGANESE	698.3	499.	79.5*~	82.6*~	114*~
	MERCURY	0.0572	0.07	LT 0.05	LT 0.05	0.0552*~
	NICKEL	17.4	14.8	4.23*~	3.28*~	5.25*~
	POTASSIUM	5,449.	3,259.	656*~	712*~	1110*~
	SODIUM	632.	282.	109*~	118*~	78.2*~
	VANADIUM	28.39	24.3	7.78*~	8.74*~	9.24*~
	ZINC	102.8	127.	20.4*~	20.7*~	23.5*~

Note.—All values in $\mu g/g$ (equal to ppm).
N/A=Not Applicable.
LT=Analyte concentration is less than Certified Reporting Limit.
*=Analyte concentration is less than TEAD UBC.
~=Analyte concentration is less than RSA UBC.
(D)=Duplicate analysis.

Table 5-11. *Summary of Biota Sample Metal Results for the TNT Washout Facility (SWMU 10)*

Test Name	Analytes	RSA Cterm	Gumweed EM5-94-01	Gumweed EM5-94-02
METALS	ALUMINUM	199.3	87.6 *	154 *
	BARIUM	19.2	8.1 *	11.1 *
	CHROMIUM	0.4501	0.26 *	0.33 *
	COBALT	0.0879	0.08 *	0.1
	COPPER	9.705	7.2 *	8 *
	IRON	176.2	94.4 *	149 *
	LEAD	1.428	0.4 *	1 *
	MANGANESE	39.97	17.4 *	23 *
	NICKEL	2.293	0.45 *	0.44 *
	VANADIUM	0.2452	ND 0.1078	0.19 *
	ZINC	21.31	21.8	24

Test Name	Analytes	RSA Cterm	Rabbitbrush EB5-94-01	Rabbitbrush EB5-94-02
METALS	ALUMINUM	106.6	140	130
	ARSENIC	0.241	0.48	0.41
	BARIUM	4.672	4.7	6.2
	CADMIUM	0.3042	0.11 *	ND 0.1019
	CHROMIUM	0.2775	0.3	0.31
	COPPER	4.815	7	9.8
	IRON	103.5	136	134
	LEAD	1.631	0.56 *	1.7
	MANGANESE	33.68	19.4 *	21.1 *
METALS	MERCURY	0.0134	0.02	0.01 *
	NICKEL	0.6769	0.39 *	0.71
	VANADIUM	0.126	0.22	0.14
	ZINC	12.19	23.2	23.2

Table 5-11. Summary of Biota Sample Metal Results for the TNT Washout Facility (SWMU 10) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL5-95-01C	Beetle EL5-95-02C
METALS	ALUMINUM	194.	74.6 *	48.6 *
	ANTIMONY	0.21	0.24	0.28
	ARSENIC	0.48	1.5	2.3
	BARIUM	2.6	3.2	2.4 *
	CADMIUM	0.15	0.22	0.19
	CHROMIUM	0.43	0.46	0.27 *
	COBALT	0.15	0.11 *	0.07 *
	COPPER	5.7	7.1	7.2
	IRON	213.	99.2 *	75.8 *
	LEAD	0.48	0.77	0.57
	MANGANESE	10.4	7.2 *	6.2 *
	MERCURY	0.01	0.02	0.02
	SELENIUM	0.13	0.17	0.12 *
	VANADIUM	0.31	0.14 *	ND 0.0688
	ZINC	43.2	44.2	45.7

Test Name	Analytes	RSA Cterm	Grasshopper EG5-95-01C	Grasshopper EG5-95-02C	Grasshopper EG5-95-03C
METALS	ALUMINUM	62.43	22.5 *	33.5 *	41.7 *
	ANTIMONY	0.105	ND 0.2079	0.28	0.29
	ARSENIC	0.0941	0.28	ND 0.1776	0.19
	BARIUM	1.994	2.5	2.5	3.3
	CADMIUM	0.5006	0.26 *	0.24 *	0.2 *
	CHROMIUM	0.3676	0.18 *	0.3 *	0.25 *
	COBALT	0.1143	ND 0.06569	0.07 *	0.07 *
	COPPER	21.21	38.7	37.3	32.8
	IRON	79.76	41.7 *	53.9 *	66.6 *
	LEAD	0.523	0.87	0.47 *	0.55
	MANGANESE	6.523	ND 3.9841	ND 3.937	4.5 *
	MERCURY	0.01	ND 0.0098	0.01	0.01
	SELENIUM	0.2014	0.11 *	0.14 *	0.16 *
	VANADIUM	0.1233	ND 0.0697	0.08 *	0.09 *
	ZINC	57.77	56.1 *	58.3	57.9

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.

Table 5-12. Summary of Biota Sample Dioxin/Furans Results for the TNT Washout Facility (SWMU 10)

Test Name	Analytes	RSA Cterm	Gumweed EM5-94-01	Gumweed EM5-94-02
DIOXIN	OCTACHLORODIBENZODIOXIN	2.5	ND 1.903	2.7298

Test Name	Analytes	RSA Cterm	Rabbitbrush EB5-94-01	Rabbitbrush EB5-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	0.9013 *	ND 0.578
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	0.3884 *	ND 0.259
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2301	0.6962	ND 0.118
	OCTACHLORODIBENZODIOXIN	4.11	5.8197	ND 1.415
	OCTACHLORODIBENZOFURAN	1.127	0.9718 *	ND 1.198
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	1.7158	ND 0.578
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	0.3884 *	ND 0.322
	TOTAL HEXACHLORODIBENZOFURANS	1.145	0.1733 *	ND 0.191
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	1.1461	ND 0.118

Table 5-12. Summary of Biota Sample Dioxin/Furans Results for the TNT Washout Facility (SWMU 10) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL5-95-02C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.305	34.3621
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.197	13.1272
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.265	1.0844
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.164	0.8999
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.259	1.526
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.1235	1.7453
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.08	3.6901
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.295	1.586
	OCTACHLORODIBENZODIOXIN	0.9155	64.9998
	OCTACHLORODIBENZOFURAN	0.7515	6.9642
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.305	34.3621
	TOTAL HEPTACHLORODIBENZOFURANS	0.2275	13.1272
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.252	4.0789
	TOTAL HEXACHLORODIBENZOFURANS	0.08	26.3413
	TOTAL PENTACHLORODIBENZOFURANS	0.3085	74.9125
	TOTAL TETRACHLORODIBENZOFURANS	0.3295	23.5952

Test Name	Analytes	RSA Cterm	Grasshopper EG5-95-01C	Grasshopper EG5-95-02C	Grasshopper EG5-95-03C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.7685	0.2238 *	ND 0.28	ND 1.667
	OCTACHLORODIBENZODIOXIN	1.849	1.568 *	1.9759	ND 3.479
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.7685	0.2238 *	0.2952 *	ND 1.667

Note.—All values in ng/kg (equal to ppt).

RSA=Reference Study Area.

Cterm=Concentration Term.

ND=Analyte not detected in sample.

* = Analyte concentration is less than Cterm.

Table 5-13. *Summary of Remaining Biota Sample Analytical Results for the TNT Washout Facility (SWMU 10)*

Test Name	Analytes	RSA Cterm	Gumweed EM5-94-01	Gumweed EM5-94-02
PAH	CHRYSENE	0.345	ND 0.68999	0.69
	PHENANTHRENE	9.39	12	9.7

Test Name	Analytes	RSA Cterm	Rabbitbrush EB5-94-01	Rabbitbrush EB5-94-02
EXPLOSIVES	2,4,6-TRINITROTOLUENE	11,553.	18000	ND 5200
	RDX	7,000.	58000	940000
PAH	FLUORANTHENE	2.227	2.5	2.4
	PHENANTHRENE	7.8	8.3	9.8
	PYRENE	0.78	0.82	0.76 *

Test Name	Analytes	RSA Cterm	Beetle EL5-95-01C	Beetle EL5-95-02C
PESTICIDES	DDE	5.5	13	ND 0.86
	DDT	0.215	5.2	ND 0.43

Test Name	Analytes	RSA Cterm	Grasshopper EG5-95-02C	Grasshopper EG5-95-03C

No Detections for Grasshoppers in this table.

Note.—All values in μg/kg (equal to ppb).
PAH=Polynuclear Aromatic Hydrocarbon.
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
*=Analyte concentration is less than Cterm.

composite grasshopper samples (EG5-95-01C through EG5-95-04C) and three *composite* beetle samples (EL5-95-01C through EL5-95-03C) were collected at SWMUs 10 and 11.

Inorganics

A total of 13 metals in rabbitbrush sample EB5-94-01 and 12 metals in sample EB5-94-02 were reported above detection limits. Cadmium at 0.11 ppm ("B") were detected in sample EB5-94-01 but not in sample EB5-94-02. The remaining 12 metals were detected in both samples as follows: aluminum (140 and 130 ppm), arsenic (0.48 ("B") and 0.41 ppm ("B")), barium (4.7 and 6.2 ppm), chromium (0.30 and 0.31 ppm), copper (7.0 and 9.8 ppm), iron (136 and 134 ppm), mercury (0.02 and 0.01 ppm), manganese (19.4 and 21.1 ppm), nickel (0.39 ("B") and 0.71 ppm ("B")), lead (0.56 and 1.7 ppm), vanadium (0.22 ("B") and 0.14 ppm ("B")), and zinc (23.2 ppm in both samples), respectively.

The two gumweed samples, EM5-94-01 and -02, contained a total of 11 and 13 metals above detection limits, respectively. Sample EM5-94-02 contained vanadium (0.19 ppm ("B")), which was not detected in sample EM5-94-01. The remaining 10 metals were detected in both gumweed samples as follows: aluminum (87.6 and 154 ppm), barium (8.1 and 11.1 ppm (both "B" qualified)), cobalt (0.08 and 0.10 ppm), chromium (0.26 and 0.33 ppm), copper (7.2 and 8.0 ppm), iron (94.4 and 149 ppm), manganese (17.4 and 23.0 ppm), nickel (0.45 and 0.44 ppm (both "B" qualified)), lead (0.40 and 1.0 ppm), and zinc (21.8 and 24.0 ppm).

A total of 14 metals were detected in 2 beetle samples (EL5-95-01C and EL51-95-02C) from SWMUs 10 and 11. These metals and the respective values, all in ppm, are aluminum (74.6 and 48.6), arsenic (1.5 and 2.3), barium (3.2 and 2.4), cadmium (0.22 and 0.19), cobalt (0.11 and 0.07), chromium (0.46 and 0.27), copper (7.1 and 7.2), iron (99.2 and 75.8), mercury (0.02 and 0.02), manganese (7.2 and 6.2), lead (0.77 and 0.57), antimony (0.24 and 0.28), selenium (0.17 and 0.12), and zinc (44.2 and 45.7). In addition, sample EL5-95-01C reported a detect of 0.14 ppm of vanadium. Similarly, nine metals were detected in three grasshopper samples from SWMUs 10 and 11, EG5-95-01C, EG5-95-02C, and EG5-95-03C. The metals and the range of values for each in ppm are aluminum (22.5 to 41.7 ppm), barium (2.5 to 3.3 ppm), cadmium (0.20 to 0.26 ppm), chromium (0.18 to 0.30 ppm), copper (32.8 to 38.7 ppm), iron (41.7 to 66.6 ppm), lead (0.47 to 0.87 ppm), selenium (0.11 to 0.16 ppm), and zinc (56.1 to 58.3 ppm). Also, arsenic was detected in samples EG5-95-01C (0.28 ppm) and EG5-95-03C (0.19 ppm); cobalt in samples EG5-95-02C and EG5-95-03C at 0.07 ppm; mercury in samples EG5-95-02C and EG5-95-03C at 0.01 ppm; manganese in sample EG5-95-03C at 4.5 ppm; antimony in samples EG5-95-02C (0.28 ppm) and EG5-95-03C (0.29 ppm); and vanadium in samples EG5-95-02C (0.08 ppm) and EG5-95-03C (0.09 ppm).

Dioxins/Furans

Rabbitbrush sample EB5-94-01 had detectable quantities of 1234678-HpCDD (0.90 ppt), 1234678-HpCDF (0.39 ppt), 2378-TCDF (0.70 ppt), OCDD (5.82 ppt), OCDF (0.97 ppt), total HpCDD (1.72 ppt), total HpCDF (0.39 ppt), total HxCDF (0.17 ppt), and total TCDF (1.15 ppt).

One gumweed sample, EM5-94-02, had a detectable quantity of OCDD at 2.73 ppt. One beetle sample for SWMUs 10 and 11, EL5-95-02C, had several dioxin/furan detections: 1234678-HpCDD at 34.36 ppt; 1234678-HpCDF at 13.13 ppt; 123478-HxCDD at 1.08 ppt; 123478-HxCDF at 0.90 ppt; 123678-HxCDD at 1.53 ppt; 123678-HxCDF at 1.74 ppt; 234678-HxCDF at 3.69 ppt; 23478-PeCDF at 1.59 ppt; OCDD at 65.0 ppt; OCDF at 6.96 ppt; total HpCDD at 34.36 ppt; total HpCDF at 13.13 ppt; total HxCDD at 4.08 ppt; total HxCDF at 26.34 ppt; total PeCDF at 74.91 ppt; and total TCDF at 23.60 ppt. SWMUs 10 and 11 grasshopper sample EG5-95-01C had three detects: 1234678-HpCDD at 0.22 ppt; OCDD at 1.57 ppt; and total HpCDD at 0.22 ppt. Sample EG5-95-02C reported OCDD at 1.98 ppt and total HpCDD at 0.30 ppt.

Explosives

The explosive RDX was reported in the two rabbitbrush samples (EB5-94-01 and -02) taken at SWMU 10. The values ranged from 58,000 to 940,000 ppb. The explosive 2,4,6-TNT was detected in sample EB5-94-01 at a level of 18,000 ppb. Grasshopper/beetle samples were not analyzed for explosives.

Herbicides

No herbicides were detected in SWMU 10 biota samples. Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

Detects of 4,4′-DDT at 5.2 ppb and 4,4′-DDE at 13 ppb were reported in beetle sample EL5-95-01C from SWMUs 10 and 11.

PAHs

Phenanthrene was detected in all four biota samples taken at SWMU 10. Other SVOCs were also detected. Rabbitbrush sample EB5-94-01 contained 2.5 ppb fluoranthene, 8.3 ppb phenanthrene, and 0.82 ppb pyrene. Rabbitbrush sample EB5-94-02 contained 2.4 ppb fluoranthene, 9.8 ppb phenanthrene, and 0.76 ppb pyrene. Gumweed sample EM5-94-01 contained only phenanthrene at a 12 ppb level. Gumweed sample EM5-94-02 analysis included 0.69 ppb of chrysene and 9.7 ppb of phenanthrene.

Grasshopper/beetle samples were not analyzed for PAHs.

5.4 SWMU 11 - LAUNDRY EFFLUENT PONDS

5.4.1 Soil Sample Results

One surface soil sample (ES6-94-01), including a field duplicate, was collected in the area of surface trash piles located east of the Laundry Effluent Pond (see Figure 5-3). The sample

was collected at a location identified during the previous RFI as containing high concentrations of numerous metals, total petroleum hydrocarbons (TPHC), and the SVOCs 2-methylnaphthalene and phenanthrene. The sample was analyzed for inorganics, dioxin/furans, pesticides/PCBs, explosives, and SVOCs. Results are summarized in Table 5-14.

Inorganics

Copper (154 and 107 $\mu g/g$), lead (1,500 and 1,600 $\mu g/g$), and zinc (843 and 402 $\mu g/g$) concentrations significantly exceeded their respective TEAD and RSA UBC values. The same analytes were detected in much higher concentrations during the previous RFI (copper at 4,600 $\mu g/g$, lead at 14,000 $\mu g/g$, and zinc at 4,000 $\mu g/g$). Antimony, cadmium, and mercury also exceeded their corresponding TEAD and RSA UBCs. Lead also exceeded the regulatory risk-based screening level for human health of 400 $\mu g/g$.

Dioxins/Furans

The compound 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin was detected at a concentration of 0.014 and 0.010 ppb. OCDD was detected at 0.55 ppb in both the sample and duplicate. Dioxins and furans were not analyzed for in the previous RFI.

Pesticides/PCBs

Dieldrin was detected at 2.74 ppb and 3.14 ppb; however, the duplicate received a "U" flag for unconfirmed detection. Endosulfan sulfate was also detected but flagged with both "U" and "Z" flags. The samples from the previous RFI were not analyzed specifically for pesticides/PCBs.

Explosives

No explosive compounds were detected.

SVOCs

No SVOCs were detected. The previous RFI detections of 2-methylnaphthalene and phenanthrene were not confirmed by the fall 1994 sampling and analysis.

5.4.2 *Biota Sample Results*

One rabbitbrush sample (EB6-94-01), one gumweed sample (EM6-04-01), and one ambrosia sample (EA6-94-01) were collected at this SWMU. No quantitative data were obtained on the ambrosia sample due to the lack of RSA comparison material and the small amount of sample gathered. No jackrabbits were collected at this SWMU. Four *composite* grasshopper samples (EG5-95-01C through EG5-95-04C) and three *composite* beetle samples (EL5-95-01C

Table 5-14. Summary of Soil Sample Analytical Results for the Laundry Effluent Ponds (SWMU 11)

Test Name	Analytes	TEAD UBC	RSA UBC	ES6-94-01	ES6-94-01(D)
DIOXINS	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	N/A	N/A	0.000014	LT 0.0000101
	OCTACHLORODIBENZODIOXIN	N/A	N/A	0.000559	0.000551
METALS	ALUMINUM	28,083.	17,300.	3710*⁻	4220*⁻
	ANTIMONY	15.	1.	15.5	16
	ARSENIC	14.5	8.86	9.52*	4.84*⁻
	BARIUM	247.1	134.	145*	86.4*⁻
	CADMIUM	0.847	1.2	2.14	1.98
	CALCIUM	114,483.	35,548.	25300*⁻	24700*⁻
	CHROMIUM	20.62	22.6	24.8	13.9*⁻
	COPPER	24.72	17.24	154	107
	IRON	22,731.	17,400.	47900	15100*⁻
	LEAD	32.49	73.3	1500	1600
	MAGNESIUM	13,114.	6,311.	3210*⁻	3600*⁻
	MANGANESE	698.3	499.	329*⁻	216*⁻
	MERCURY	0.0572	0.07	0.0813	0.0719
	NICKEL	17.4	14.8	35.7	10.8*⁻
	POTASSIUM	5,449.	3,259.	961*⁻	1060*⁻
	SODIUM	632.	282.	88.3*⁻	114*⁻
	VANADIUM	28.39	24.3	7.88*⁻	9.18*⁻
	ZINC	102.8	127.	843	402
PESTICIDES/PCBS	DIELDRIN	N/A	N/A	0.00314	0.00274
	ENDOSULFAN SULFATE	N/A	N/A	0.000545	ND 0.0005

Note.—All values in $\mu g/g$ (equal to ppm).

N/A=Not Applicable.

*=Analyte concentration is less than TEAD UBC.

⁻=Analyte concentration is less than RSA UBC.

(D)=Duplicate analysis.

LT=Analyte concentration is less than Certified Reporting Limit.

ND=Analyte not detected in sample.

through EL5-95-03C) were collected at SWMUs 10 and 11. Analyte detections are summarized in Tables 5-15 through 5-17.

Inorganics

The rabbitbrush sample from SWMU 11 contained 11 metals above detection limits. The metals and their respective concentration are as follows: aluminum (21.5 ppm), arsenic (0.36 ppm ("B")), barium (5.2 ppm), chromium (0.16 ppm ("B")), copper (4.4 ppm), iron (27.2 ppm), mercury (0.01 ppm), manganese (8.3 ppm), nickel (0.69 ppm ("B")), lead (0.77 ppm), and zinc (11.0 ppm).

The gumweed sample from SWMU 11 contained nine metals above detection limits. These metals included aluminum (149 ppm), barium (11.6 ppm), chromium (0.31 ppm), copper (9.5 ppm), iron (122 ppm), manganese (18.3 ppm), nickel (0.56 ppm ("B")), lead (1.4 ppm), and zinc (21.3 ppm). Refer to Section 5.3.2, SWMU 10 Biota Sample Results, for discussions of grasshopper and beetle analyses.

Dioxins/Furans

The single rabbitbrush sample, EB6-94-01, had detectable quantities of 1234678-HpCDF (0.83 ppt), 234678-HxCDF (0.41 ppt), OCDD (2.30 ppt), OCDF (2.03 ppt), total HpCDF (0.83 ppt), total HxCDF (0.97 ppt), total PeCDF (5.50 ppt), and total TCDF (9.41 ppt).

One gumweed sample, EM6-94-01, had detectable concentrations of OCDD at 3.04 ppt.

Refer to Section 5.3.2, SWMU 10 Biota Sample Results, for discussions of grasshopper and beetle analyses.

Explosives

No explosives were detected in SWMU 11 biota samples. Grasshopper/beetle samples were not analyzed for explosives.

Herbicides

No herbicides were detected in SWMU 11 biota samples. Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

Rabbitbrush sample EB6-94-01 analysis reported a value of 140 ppb of 4,4'-DDE.

Beetle sample EL5-95-01C analysis showed detects of 5.2 ppb of 4,4′-DDT and 13 ppb of 4,4′-DDE.

Table 5-15. Summary of Biota Sample Metal Results for the Laundry Effluent Ponds (SWMU 11)

Test Name	Analytes	RSA Cterm	Gumweed EM6-94-01
METALS	ALUMINUM	199.3	149 *
	BARIUM	19.2	11.6 *
	CHROMIUM	0.4501	0.31 *
	COPPER	9.705	9.5 *
	IRON	176.2	122 *
	LEAD	1.428	1.4 *
	MANGANESE	39.97	18.3 *
	NICKEL	2.293	0.56 *
	ZINC	21.31	21.3 *

Test Name	Analytes	RSA Cterm	Rabbitbrush EB6-94-01
METALS	ALUMINUM	106.6	21.5 *
	ARSENIC	0.241	0.36
	BARIUM	4.672	5.2
	CHROMIUM	0.2775	0.16 *
	COPPER	4.815	4.4 *
	IRON	103.5	27.2 *
	LEAD	1.631	0.77 *
	MANGANESE	33.68	8.3 *
	MERCURY	0.0134	0.01 *
	NICKEL	0.6769	0.68999
	ZINC	12.19	11 *

Table 5-15. Summary of Biota Sample Metal Results for the Laundry Effluent Ponds (SWMU 11) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL5-95-01C	Beetle EL5-95-02C
METALS	ALUMINUM	194.	74.6 *	48.6 *
	ANTIMONY	0.21	0.24	0.28
	ARSENIC	0.48	1.5	2.3
	BARIUM	2.6	3.2	2.4 *
	CADMIUM	0.15	0.22	0.19
	CHROMIUM	0.43	0.46	0.27 *
	COBALT	0.15	0.11 *	0.07 *
	COPPER	5.7	7.1	7.2
	IRON	213.	99.2 *	75.8 *
	LEAD	0.48	0.77	0.57
	MANGANESE	10.4	7.2 *	6.2 *
	MERCURY	0.01	0.02	0.02
	SELENIUM	0.13	0.17	0.12 *
	VANADIUM	0.31	0.14 *	ND 0.0688
	ZINC	43.2	44.2	45.7

Test Name	Analytes	RSA Cterm	Grasshopper EG5-95-01C	Grasshopper EG5-95-02C	Grasshopper EG5-95-03C
METALS	ALUMINUM	62.43	22.5 *	33.5 *	41.7 *
	ANTIMONY	0.105	ND 0.2079	0.28	0.29
	ARSENIC	0.0941	0.28	ND 0.1776	0.19
	BARIUM	1.994	2.5	2.5	3.3
	CADMIUM	0.5006	0.26 *	0.24 *	0.2 *
	CHROMIUM	0.3676	0.18 *	0.3 *	0.25 *
	COBALT	0.1143	ND 0.06569	0.07 *	0.07 *
	COPPER	21.21	38.7	37.3	32.8
	IRON	79.76	41.7 *	53.9 *	66.6 *
	LEAD	0.523	0.87	0.47 *	0.55
	MANGANESE	6.523	ND 3.9841	ND 3.937	4.5 *
	MERCURY	0.	ND 0.0098	0.01	0.01
	SELENIUM	0.2014	0.11 *	0.14 *	0.16 *
	VANADIUM	0.1233	ND 0.0697	0.08 *	0.09 *
	ZINC	57.77	56.1 *	58.3	57.9

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.

Table 5-16. Summary of Biota Sample Dioxin/Furans Results for the Laundry Effluent Ponds (SWMU 11)

Test Name	Analytes	RSA Cterm	Gumweed EM6-94-01
DIOXIN	OCTACHLORODIBENZODIOXIN	2.5	3.0437

Test Name	Analytes	RSA Cterm	Rabbitbrush EB6-94-01
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	0.8309
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.2849	0.4081
	OCTACHLORODIBENZODIOXIN	4.11	2.3026 *
	OCTACHLORODIBENZOFURAN	1.127	2.0281
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	0.8309
	TOTAL HEXACHLORODIBENZOFURANS	1.145	0.9657 *
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	5.5004
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	9.413

Table 5-16. Summary of Biota Sample Dioxin/Furans Results for the Laundry Effluent Ponds (SWMU 11) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL5-95-02C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.305	34.3621
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.197	13.1272
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.265	1.0844
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.164	0.8999
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.259	1.526
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.1235	1.7453
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.08	3.6901
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.295	1.586
	OCTACHLORODIBENZODIOXIN	0.9155	64.9998
	OCTACHLORODIBENZOFURAN	0.7515	6.9642
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.305	34.3621
	TOTAL HEPTACHLORODIBENZOFURANS	0.2275	13.1272
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.252	4.0789
	TOTAL HEXACHLORODIBENZOFURANS	0.08	26.3413
	TOTAL PENTACHLORODIBENZOFURANS	0.3085	74.9125
	TOTAL TETRACHLORODIBENZOFURANS	0.3295	23.5952

Test Name	Analytes	RSA Cterm	Grasshopper EG5-95-01C	Grasshopper EG5-95-02C	Grasshopper EG5-95-03C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.7685	0.2238 *	ND 0.28	ND 1.667
	OCTACHLORODIBENZODIOXIN	1.849	1.568 *	1.9759	ND 3.479
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.7685	0.2238 *	0.2952 *	ND 1.667

Note.—All values in ng/kg (equal to ppt).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.

Table 5-17. Summary of Remaining Biota Sample Analytical Results for the Laundry Effluent Ponds (SWMU 11)

Test Name	Analytes	RSA Cterm	Gumweed EM6-94-01
PAH	PHENANTHRENE	9.39	15

Test Name	Analytes	RSA Cterm	Rabbitbrush EB6-94-01
PAH	CHRYSENE	0.5024	7.7
	PHENANTHRENE	7.8	16
PESTICIDES	DDE	61.56	140

Test Name	Analytes	RSA Cterm	Beetle EL5-95-01C	Beetle EL5-95-02C
PESTICIDES	DDE	5.5	13	ND 0.86
	DDT	0.215	5.2	ND 0.43

Test Name	Analytes	RSA Cterm	Grasshopper EG5-95-02C	Grasshopper EG5-95-03C

No Detections for Grasshoppers in this table.

Note.—All values in $\mu g/kg$ (equal to ppb).
PAH=Polynuclear Aromatic Hydrocarbon.
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
*=Analyte concentration is less than Cterm.

PAHs

The rabbitbrush sample EB6-94-01 had reportable quantities of chrysene (7.7 ppb) and phenanthrene (16 ppb). The gumweed sample EM6-94-01 reported 15 ppb of phenanthrene.

Grasshopper/beetle samples were not analyzed for PAHs.

5.5 SWMUs 12/15 PESTICIDE DISPOSAL AREA/SANITARY LANDFILL

5.5.1 Soil Sample Results

A total of four surface soil samples and two duplicate samples were collected (ES7-94-01 and -01D, ES8-94-01, ES8-94-02, and ES8-94-03 and -03D) at the Sanitary Landfill (Figure 5-4). The sample locations were selected on the basis of previous RFI sample locations containing a variety of contaminants including metals, VOCs, SVOCs, and pesticides. Sample ES7-94-01 was collected in the area of the landfill previously suspected to have been a pesticide disposal area. During the previous RFI, however, the disposal area could not be confirmed, and it was recommended that all data be assessed as one area. Therefore, all data collected within the landfill area have been combined. Samples ES7-94-01 and ES8-94-01 through -03 were analyzed for inorganics, dioxins/furans, pesticides/PCBs, explosives, and SVOCs. Results are summarized in Table 5-18.

Inorganics

The primary metals detected above both TEAD and RSA UBC concentrations include arsenic (two samples), cadmium (three samples), copper (two samples), lead (four samples), and zinc (two samples). Highest concentrations of metals were detected in sample ES8-94-02 with arsenic at 67 μg/g, copper at 3,800 μg/g, lead at 224 μg/g, and zinc at 594 μg/g. This sample corresponds to an RFI surface soil sample location that contained above background concentrations of arsenic, cadmium, chromium, cobalt, copper, iron, lead, and zinc typically at higher concentrations (e.g., lead at 920 μg/g).

Dioxins/Furans

The compound 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin was detected in sample ES8-94-02 at 0.37 ppb, and 1,2,3,4,6,7,8-heptachlorodibenzofuran was detected in sample ES8-94-03 at 0.01 ppb. Octachlorodibenzodioxin (OCDD) was detected in the ES7-94-01 duplicate at 0.18 ppb, in ES8-94-02 at 3.5 ppb, in ES8-94-03 at 5.5 ppb, and in ES8-94-03 duplicate at 4.4 ppb. TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) was detected in samples ES8-94-01 through -03 at concentrations ranging from 0.01 to 0.02 ppb. The previous RFI samples were not analyzed for dioxins/furans.

Table 5-18. Summary of Soil Sample Analytical Results for the Pesticide Disposal/Sanitary Landfill (SWMU 12/15)

Test Name	Analytes	TEAD UBC	RSA UBC	ES7-94-01	ES7-94-01(D)	ES8-94-01	ES8-94-02	ES8-94-03	ES8-94-03(D)
SEMIVOLATILES	2-METHYLNAPHTHALENE	N/A	N/A	LT 0.032	LT 0.032	4.9	0.57	LT 0.032	LT 0.032
	ACENAPHTHENE	N/A	N/A	0.31	0.26	60	LT 0.041	LT 0.041	LT 0.041
	ANTHRACENE	N/A	N/A	LT 0.71	LT 0.71	70	LT 0.71	LT 0.71	LT 0.71
	BENZO [A] ANTHRACENE	N/A	N/A	1.2	1	100	0.21	0.21	0.35
	BENZO [A] PYRENE	N/A	N/A	LT 1.2	LT 1.2	100	LT 1.2	LT 1.2	LT 1.2
	BENZO [B] FLUORANTHENE	N/A	N/A	2.4	1.9	100	LT 0.31	LT 0.31	LT 0.31
	BENZO [G,H,I] PERYLENE	N/A	N/A	0.92	0.8	60	LT 0.18	LT 0.18	LT 0.18
	BENZO [K] FLUORANTHENE	N/A	N/A	0.77	0.69	100	LT 0.13	0.27	0.48
	CHRYSENE	N/A	N/A	1.6	1.2	200	0.3	0.31	0.46
	DIBENZ [AH] ANTHRACENE	N/A	N/A	LT 0.31	LT 0.31	30	LT 0.31	LT 0.31	LT 0.31
	DIBENZOFURAN	N/A	N/A	LT 0.38	LT 0.38	20	LT 0.38	LT 0.38	LT 0.38
	FLUORANTHENE	N/A	N/A	1.2	0.95	200	0.18	0.28	0.42
	FLUORENE	N/A	N/A	0.13	LT 0.065	40	LT 0.065	LT 0.065	LT 0.065
	INDENO [1,2,3-C,D] PYRENE	N/A	N/A	LT 2.4	LT 2.4	60	LT 2.4	LT 2.4	LT 2.4
	NAPHTHALENE	N/A	N/A	LT 0.74	LT 0.74	20	LT 0.74	LT 0.74	LT 0.74
	PHENANTHRENE	N/A	N/A	1.5	1.3	400	0.45	0.32	0.51
	PYRENE	N/A	N/A	1.9	2	400	0.43	0.57	0.84

Table 5-18. Summary of Soil Sample Analytical Results for the Pesticide Disposal/Sanitary Landfill (SWMU 12/15) (continued)

Test Name	Analytes	TEAD UBC	RSA UBC	ES7-94-01	ES7-94-01(D)	ES8-94-01	ES8-94-02	ES8-94-03	ES8-94-03(D)
DIOXINS	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	N/A	N/A	LT 0.0000107	LT 0.0000086	LT 0.00014	0.000379	LT 0.000001	LT 0.000301
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	N/A	N/A	LT 0.0000129	LT 0.0000177	LT 0.0000282	LT 0.000035	0.0000158	LT 0.0000204
	2,3,7,8 TETRACHLORODIBENZODIOXIN	N/A	N/A	LT 0.0000112	LT 0.0000108	0.0000172	0.0000247	0.0000191	0.0000173
	OCTACHLORODIBENZODIOXIN	N/A	N/A	LT 0.0000522	0.000184	LT 0.00259	0.00348	0.00553	0.00439
METALS	ALUMINUM	28083	17300	4870*⁻	4980*⁻	7270*⁻	7070*⁻	7460*⁻	7320*⁻
	ANTIMONY	15	1	1.39*	LT 1	LT 1	9.94*	5.52*	6.71*
	ARSENIC	14.5	8.86	12.1*	9.57*	7.36*⁻	67	19.8	38
	BARIUM	247.1	134	123*⁻	115*⁻	88.9*⁻	232*	118*⁻	141*
	BERYLLIUM	1.455	0.82	LT 0.427	LT 0.427	LT 0.427	LT 0.427	LT 0.427	0.501*⁻
	CADMIUM	0.847	1.2	LT 1.2	LT 1.2	6	1.69	1.53	LT 1.2
	CALCIUM	114483	35548	66000*	52600*	43400*	32300*⁻	36200*	39000*
	CHROMIUM	20.62	22.6	11.7*⁻	11.8*⁻	49.2	19.1*⁻	18.7*⁻	18.6*⁻
	COBALT	6.94	7.99	LT 2.5	LT 2.5	3.34*⁻	15.3	3.9*⁻	3.68*⁻
	COPPER	24.72	17.24	12.3*⁻	12.9*⁻	18.9*	3800	62	104
	IRON	22731	17400	6130*⁻	7330*⁻	10600*⁻	36800	11300*⁻	14500*⁻
	LEAD	32.49	73.3	70.9⁻	96.4	75.8	224	91.8	75
	MAGNESIUM	13114	6311	4950*⁻	8180*	4900*⁻	5090*⁻	5320*⁻	5350*⁻
	MANGANESE	698.3	499	157*⁻	176*⁻	212*⁻	250*⁻	305*⁻	313*⁻
	MERCURY	0.0572	0.07	LT 0.05	LT 0.05	0.0618⁻	0.849	LT 0.05	LT 0.05
	NICKEL	17.4	14.8	4.66*⁻	5.6*⁻	11.2*⁻	11.9*⁻	8.93*⁻	13.6*⁻
	POTASSIUM	5449	3259	1510*⁻	1670*⁻	2330*⁻	1420*⁻	2290*⁻	2330*⁻
	SELENIUM	0.449	0.449	LT 0.449	LT 0.449	LT 0.449	0.733	LT 0.449	LT 0.449
	SODIUM	632	282	105*⁻	101*⁻	97.6*⁻	912	129*⁻	135*⁻
	VANADIUM	28.39	24.3	9.28*⁻	12*⁻	12.8*⁻	11.1*⁻	12.5*⁻	11.7*⁻
	ZINC	102.8	127	52.7*⁻	52.3*⁻	107⁻	594	NT	126⁻

Table 5-18. Summary of Soil Sample Analytical Results for the Pesticide Disposal/Sanitary Landfill (SWMU 12/15) (continued)

Test Name	Analytes	TEAD UBC	RSA UBC	ES7-94-01	ES7-94-01(D)	ES8-94-01	ES8-94-02	ES8-94-03	ES8-94-03(D)
PESTICIDES/PCBS	ALDRIN	N/A	N/A	0.00273	LT 0.0014	0.00182	LT 0.0014	0.00257	0.00214
	ALPHA CHLORDANE	N/A	N/A	0.0128	0.0154	ND 0.004	ND 0.004	ND 0.004	0.0073
	ALPHA-ENDOSULFAN	N/A	N/A	LT 0.001	LT 0.001	0.0035	LT 0.001	LT 0.001	LT 0.001
	BETA-ENDOSULFAN	N/A	N/A	LT 0.0007	LT 0.0007	0.00253	0.00179	LT 0.0007	LT 0.0007
	CHLORDANE	N/A	N/A	0.254	0.294	LT 0.0684	LT 0.0684	LT 0.0684	LT 0.0684
	DDD	N/A	N/A	LT 0.0027	LT 0.0027	0.00734	LT 0.0027	LT 0.0027	LT 0.0027
	DDE	N/A	N/A	LT 0.0027	LT 0.0027	0.0291	LT 0.0027	LT 0.0027	LT 0.0027
	DDT	N/A	N/A	LT 0.0035	0.00511	0.0501	0.0113	LT 0.0035	LT 0.0035
	DIELDRIN	N/A	N/A	0.0026	0.00333	0.015	0.00453	LT 0.0016	LT 0.0016
	ENDOSULFAN SULFATE	N/A	N/A	ND 0.0005	ND 0.0005	ND 0.0005	0.000948	ND 0.0005	ND 0.0005
	ENDRIN	N/A	N/A	0.0124	0.015	LT 0.0065	LT 0.0065	LT 0.0065	LT 0.0065
	ENDRIN KETONE	N/A	N/A	ND 0.0005	0.00177	0.00748	ND 0.0005	ND 0.0005	ND 0.0005
	GAMMA-CHLORDANE	N/A	N/A	0.0139	0.017	ND 0.004	ND 0.004	ND 0.004	ND 0.004
	HEPTACHLOR	N/A	N/A	LT 0.0022	LT 0.0022	0.00266	0.00713	LT 0.0022	LT 0.0022
	HEPTACHLOREPOXIDE	N/A	N/A	LT 0.0013	LT 0.0013	LT 0.0013	0.00175	LT 0.0013	LT 0.0013

Note.—All values in $\mu g/g$ (equal to ppm).

N/A=Not Applicable.

LT=Analyte concentration is less than Certified Reporting Limit.

*=Analyte concentration is less than TEAD UBC.

˜=Analyte concentration is less than RSA UBC.

ND=Analyte not detected in sample.

(D)=Duplicate analysis.

NT=Not Tested (or the sample was rejected).

Pesticides/PCBs

Alpha chlordane was detected in sample ES7-94-01 and its duplicate at 0.0129 μg/g and 0.0154 μg/g, respectively, and in the ES8-94-03 duplicate. The latter sample, however, was accompanied by a "U" flag and was not detected in the original sample. Gamma chlordane and technical chlordane were also detected in sample ES7-94-01 and its duplicate. Alpha-endosulfan was confirmed in ES8-94-01 at 0.0035 μg/g. Beta-endosulfan was also reported in samples ES8-94-01 and -02 but flagged as unconfirmed in both. Aldrin, in samples ES7-94-01, ES8-94-01, and ES8-94-03, was also accompanied by a "U" flag in each case. Dieldrin was detected in sample ES7-94-01 and its duplicate, and in ES8-94-01 and -02. Endrin ketone (ES7-94-01 duplicate and ES8-94-01), endosulfan sulfate (ES8-94-02), and heptachlor (ES8-94-01 and -02) were detected but flagged as unconfirmed. Heptachlor epoxide was detected and confirmed in sample ES8-94-02. ES8-94-01 contained confirmed detections of p,p-DDD, p,p-DDE, and p,p-DDT. The pesticide p,p-DDT was also detected in samples ES7-94-01 and ES8-94-02. The pesticides detected and their corresponding concentrations were consistent with those reported in the previous RFI. Low concentrations of PCB 1260 detected in the previous RFI were not confirmed by the current sampling and analysis results.

Explosives

No explosive compounds were detected.

SVOCs

As with the previous RFI, numerous SVOCs were detected in surface soils of the landfill, including 2-methylnaphthalene, acenaphthene, anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, dibenzofuran, endrin ketone, fluoranthene, fluorene, indeno[1,2,3-c,d]pyrene, naphthalene, phenanthrene, and pyrene. Maximum concentrations were detected in sample ES8-94-01 located near a previous RFI test pit location in the south-central portion of the landfill at concentrations well above previously detected levels. These high concentrations include benzo[a]anthracene (100 μg/g), benzo[a]pyrene (100 μg/g), benzo[b]fluoranthene (100 μg/g), benzo[k]fluoranthene (100 μg/g), chrysene (200 μg/g), fluoranthene (200 μg/g), phenanthrene (400 μg/g), and pyrene (400 μg/g). These concentrations well exceed risk-based criteria for human health. The remaining samples all contained various SVOCs at much lower levels (< 1 μg/g).

5.5.2 Biota Sample Results

One sweetclover sample (EC7-94-01) and one rabbitbrush sample (EB7-94-01) were collected in the area previously reported to be the area of pesticide disposal (SWMU 12). Three rabbitbrush samples (EB8-94-01 through -03), two sweetclover samples (EC8-94-01 and -02), and one gumweed sample (EM8-94-03) were collected within the landfill (SWMU 15). No jackrabbits were collected at this SWMU. Five *composite* grasshopper samples (EG7-95-01C

through EG7-95-05C) and one *composite* beetle sample (EL7-95-01C) were collected at SWMUs 12/15. Summaries of analyte concentrations in SWMUs 12/15 biota are reported in Tables 5-19 through 5-21.

<u>Inorganics</u>

The sweetclover sample from the suspect area of SWMU 12 (EC7-94-01) contained a total of 11 metals above detection limits. These metals and their respective concentration are as follows: arsenic (0.54 ppm ("B")), barium (8.1 ppm), cobalt (0.10 ppm ("B")), chromium (0.16 ppm ("B")), copper (2.4 ppm), iron (14.6 ppm), mercury (0.01 ppm), manganese (11.1 ppm), nickel (1.1 ppm), lead (0.58 ppm), and zinc (2.3 ppm).

The rabbitbrush sample (EB7-94-01) from the suspect area of SWMU 12 contained a total of 12 metals above detection limits, including aluminum (52.4 ppm), arsenic (0.33 ppm ("B")), barium (3.9 ppm ("B")), cadmium (0.13 ppm ("B")), chromium (0.19 ppm ("B)), copper (9.0 ppm), iron (70 ppm), manganese (12.8 ppm), nickel (0.87 ppm), lead (2.1 ppm), vanadium (0.11 ppm ("B")), and zinc (40.1 ppm).

The 3 rabbitbrush samples from SWMU 15 (EB8-94-01, -02, and -03) each contained the same 13 metals above detection limits. These metals and their respective ranges are aluminum (40 to 138 ppm), arsenic (0.40 to 0.53 ppm) (all values "B" qualified), barium (1.9 to 2.6 ppm) (all values "B" qualified), cadmium (0.16 ("B") to 1.7 ppm), chromium (0.20 to 0.43 ppm), copper (4.3 to 10.6 ppm), iron (51.2 to 150 ppm), manganese (9.6 to 20.1 ppm), nickel (0.83 to 1.2 ppm), lead (1.0 to 2.8 ppm), vanadium (0.08 to 0.23 ppm) (all values "B" qualified), and zinc (21.9 to 102 ppm).

For the three sweetclover samples from the landfill (EC8-94-01, -01 duplicate, and -02), mercury at 0.01 ppm was detected in sample EC8-94-01 but not its duplicate or sample EC8-94-02, and beryllium was detected only in EC8-94-01 duplicate at a "B"-qualified value of 0.0095 ppm. Twelve other metals were detected in both samples and the duplicate, including aluminum (46.1 to 66.2 ppm), arsenic (0.42 to 0.91 ppm) (all values "B" qualified), barium (11 to 23 ppm), cadmium (0.15 to 0.36 ppm) (all values "B" qualified), cobalt (0.09 to 0.12 ppm) (all values "B" qualified), chromium (0.34 to 0.36 ppm), copper (3.4 to 4.2 ppm), iron (52.1 to 82.6 ppm), manganese (5.9 to 12.3 ppm), nickel (0.39 to 0.53 ppm), lead (0.91 to 1.9 ppm) (all "B" qualified), and zinc (7.2 to 12 ppm).

The one gumweed sample from the landfill (EM8-94-03) contained eight metals above detection limits, including barium (2.6 ppm ("B")), cadmium (5.3 ppm), chromium (0.20 ppm ("B")), copper (9.0 ppm), manganese (7.0 ppm), nickel (0.74 ppm ("B")), lead (1.3 ppm), and zinc (146 ppm).

Fourteen metals were detected in the single composite beetle sample from SWMUs 12 and 15 (EL7-95-01C). The metals and their reported detected values in ppm are as follows: aluminum (37.6), arsenic (2.9), barium (1.9), cadmium (0.22), cobalt (0.07), chromium (0.28), copper (7.6), iron (69.7), mercury (0.02), manganese (5.7), nickel (0.4), lead (0.85),

Table 5-19. Summary of Biota Sample Metal Results for the Pesticide Disposal/Sanitary Landfill (SWMU 12/15)

Test Name	Analytes	RSA Cterm	Sweetclover EC7-94-01	Sweetclover EC8-94-01	Sweetclover EC8-94-01 DUP	Sweetclover EC8-94-02
METALS	ALUMINUM	40.95	ND 11.232	46.1	57.6896	66.2
	ARSENIC	0.2804	0.54	0.91	0.425	0.67
	BARIUM	15.43	8.1 *	16	23.046	11.1 *
	BERYLLIUM	0.002	NV	NV	0.0095	NV
	CADMIUM	0.082	ND 0.1287	0.15	0.2037	0.36
	CHROMIUM	0.2522	0.16 *	0.34	0.3559	0.34
	COBALT	0.0958	0.1	0.09 *	0.1015	0.12
	COPPER	5.9	2.4 *	3.4 *	4.2161 *	4.1 *
	IRON	47.33	14.6 *	52.1	82.6472	72.9
	LEAD	0.5018	0.58	1.2	0.9111	1.9
	MANGANESE	11.2	11.1 *	6.1 *	12.3808	5.9 *
	MERCURY	0.0121	0.01 *	0.01 *	ND 0.0099	ND 0.00959
	NICKEL	0.634	1.1	0.39 *	0.5323 *	0.43 *
	ZINC	6.422	2.3 *	7.3	7.214	12

Table 5-19. Summary of Biota Sample Metal Results for the Pesticide Disposal/Sanitary Landfill (SWMU 12/15) (continued)

Test Name	Analytes	RSA Cterm	Gumweed EM8-94-03
METALS	BARIUM	19.2	2.6 *
	CADMIUM	0.5765	5.3
	CHROMIUM	0.4501	0.2 *
	COPPER	9.705	9 *
	LEAD	1.428	1.3 *
	MANGANESE	39.97	7 *
	NICKEL	2.293	0.74 *
	ZINC	21.31	146

Test Name	Analytes	RSA Cterm	Rabbitbrush EB7-94-01	Rabbitbrush EB8-94-01	Rabbitbrush EB8-94-02	Rabbitbrush EB8-94-03
METALS	ALUMINUM	106.6	52.4 *	40 *	138	53 *
	ARSENIC	0.241	0.33	0.53	0.49	0.4
	BARIUM	4.672	3.9 *	1.9 *	2.6 *	1.9 *
	CADMIUM	0.3042	0.13 *	0.16 *	0.18 *	1.7
	CHROMIUM	0.2775	0.19 *	0.23 *	0.43	0.2 *
	COPPER	4.815	9	5.5	4.3 *	10.6
	IRON	103.5	69.6 *	51.2 *	150	71.1 *
	LEAD	1.631	2.1	1.4 *	2.8	1 *
	MANGANESE	33.68	12.8 *	20.1 *	12.1 *	9.6 *
	NICKEL	0.6769	0.87	1.2	0.98	0.83
	VANADIUM	0.126	0.11 *	0.08 *	0.23	0.11 *
	ZINC	12.19	40.1	21.9	53.4	102

Table 5-19. Summary of Biota Sample Metal Results for the Pesticide Disposal/Sanitary Landfill (SWMU 12/15) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL7-95-01C
METALS	ALUMINUM	194.	37.6 *
	ARSENIC	0.48	2.9
	BARIUM	2.6	1.9 *
	CADMIUM	0.15	0.22
	CHROMIUM	0.43	0.28 *
	COBALT	0.15	0.07 *
	COPPER	5.7	7.6
	IRON	213.	69.7 *
	LEAD	0.48	0.85
	MANGANESE	10.4	5.7 *
	MERCURY	0.01	0.02
	NICKEL	1.	0.4 *
	SELENIUM	0.13	0.19
	ZINC	43.2	53

Test Name	Analytes	RSA Cterm	Grasshopper EG7-95-01C	Grasshopper EG7-95-02C	Grasshopper EG7-95-03C	Grasshopper EG7-95-04C	Grasshopper EG7-95-05C
METALS	ALUMINUM	62.43	34.5 *	37.7 *	29.5 *	30 *	30.8 *
	ANTIMONY	0.105	0.2	0.23	0.28	0.25	0.29
	ARSENIC	0.0941	ND 0.1827	ND 0.181	ND 0.1759	0.22	ND 0.1845
	BARIUM	1.994	1.6 *	2.5	1.7 *	2.6	2.6
	CADMIUM	0.5006	0.2 *	0.3 *	0.17 *	0.2 *	0.32 *
	CHROMIUM	0.3676	0.26 *	0.25 *	0.21 *	0.24 *	0.23 *
	COBALT	0.1143	ND 0.0656	0.08 *	0.08 *	0.09 *	ND 0.0656
	COPPER	21.21	22.8	25	21 *	20.4 *	24.7
	IRON	79.76	49.9 *	50 *	48.3 *	45.2 *	46.3 *
	LEAD	0.523	ND 0.2981	ND 0.2952	0.37 *	0.57	0.38 *
	MANGANESE	6.523	ND 3.9761	4.3 *	4.4 *	5.4 *	4 *
	MERCURY	0.	ND 0.0099	ND 0.01	ND 0.0097	0.02	ND 0.0095
	NICKEL	0.5127	0.51 *	ND 0.3909	ND 0.387	ND 0.3893	ND 0.3917
	SELENIUM	0.2014	0.13 *	ND 0.0952	ND 0.0926	0.16 *	0.11 *
	VANADIUM	0.1233	ND 0.0696	0.08 *	ND 0.0688	ND 0.0692	ND 0.0696
	ZINC	57.77	58.7	58	60.4	61.4	61.6

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.
NV=Not a Valid Detect.
DUP=Duplicate analysis.

Table 5-20. Summary of Biota Sample Dioxin/Furans Results for the Pesticide Disposal/Sanitary Landfill (SWMU 12/15)

Test Name	Analytes	RSA Cterm	Gumweed EM8-94-03
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	1.516	3.3585
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.732	1.0088
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.98	0.3095 *
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.5025	0.0892 *
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	1.063	0.2169 *
	OCTACHLORODIBENZODIOXIN	2.5	13.2916
	OCTACHLORODIBENZOFURAN	1.11	1.7251
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.9946	5.0815
	TOTAL HEPTACHLORODIBENZOFURANS	0.909	1.4297
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	1.066	1.5178
	TOTAL HEXACHLORODIBENZOFURANS	0.3963	1.096
	TOTAL PENTACHLORODIBENZOFURANS	0.4507	0.521
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.3008	0.1296 *
	TOTAL TETRACHLORODIBENZOFURANS	1.254	0.5528 *

Test Name	Analytes	RSA Cterm	Rabbitbrush EB7-94-01	Rabbitbrush EB8-94-01	Rabbitbrush EB8-94-02	Rabbitbrush EB8-94-03
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	ND 0.558	ND 0.723	9.4821	ND 0.215
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	ND 0.242	ND 0.305	1.7997	0.436 *
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.743	ND 0.369	ND 0.449	0.8308	ND 0.167
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.2849	ND 0.184	ND 0.233	0.4099	NV
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2301	ND 0.109	ND 0.154	0.4143	ND 0.076
	OCTACHLORODIBENZODIOXIN	4.11	1.8642 *	ND 1.977	79.1523	ND 0.46
	OCTACHLORODIBENZOFURAN	1.127	ND 1.065	ND 1.673	6.7921	1.4148
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	ND 0.558	ND 0.723	NV	0.6323 *
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	ND 0.3	ND 0.378	3.9014	0.436 *
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.8575	ND 0.37	ND 0.451	6.9968	0.2393 *
	TOTAL HEXACHLORODIBENZOFURANS	1.145	ND 0.181	ND 0.229	2.2504	ND 0.08599
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	ND 0.189	ND 0.282	0.5927	ND 0.114
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.203	ND 0.17	ND 0.217	ND 0.173	0.1628 *
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	ND 0.109	ND 0.154	1.8561	0.1502 *

Table 5-20. Summary of Biota Sample Dioxin/Furans Results for the Pesticide Disposal/Sanitary Landfill (SWMU 12/15) (continued)

Test Name	Analytes	RSA Cterm	Sweetclover EC7-94-01	Sweetclover EC8-94-01	Sweetclover EC8-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9342	ND 0.573	1.233	ND 1.062
	OCTACHLORODIBENZODIOXIN	7.662	4.1334 *	9.9016	19.9775
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.616	ND 0.573	2.9694	2.5939
	TOTAL HEPTACHLORODIBENZOFURANS	2.184	ND 0.321	0.5603 *	1.2184 *
	TOTAL PENTACHLORODIBENZOFURANS	0.2157	0.4842	0.177 *	ND 0.234
	TOTAL TETRACHLORODIBENZOFURANS	0.3733	0.8015	ND 0.106	ND 0.188

Test Name	Analytes	RSA Cterm	Grasshopper EG7-95-01C	Grasshopper EG7-95-03C	Grasshopper EG7-95-04C	Grasshopper EG7-95-05C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.7685	ND 2.35	ND 4.747	3.9039	ND 4.453
	OCTACHLORODIBENZODIOXIN	1.849	ND 3.167	ND 4.2	32.842	ND 12.433
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.7685	ND 2.35	ND 4.747	3.9039	ND 4.453

Note.—All values in ng/kg (equal to ppt).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.
NV=Not a Valid Detect.

Table 5-21. *Summary of Remaining Biota Sample Analytical Results for the Pesticide Disposal/Sanitary Landfill (SWMU 12/15)*

Test Name	Analytes	RSA Cterm	Gumweed EM8-94-03
PAH	CHRYSENE	0.345	0.95
	FLUORANTHENE	1.8	3.9
	PHENANTHRENE	9.39	13
	PYRENE	0.9	2.4

Test Name	Analytes	RSA Cterm	Rabbitbrush EB7-94-01	Rabbitbrush EB8-94-01	Rabbitbrush EB8-94-02	Rabbitbrush EB8-94-03
EXPLOSIVES	2,4,6-TRINITROTOLUENE	11,553.	ND 5200	6300 *	ND 4800	7800 *
PAH	BENZO [A] ANTHRACENE	0.18	ND 0.36	0.68	0.93	ND 0.36
	CHRYSENE	0.5024	ND 0.83	3.1	4.3	1.6
	FLUORANTHENE	2.227	2.6	20	14	3.7
	PHENANTHRENE	7.8	20	64	76	18
	PYRENE	0.78	0.89	13	7.4	1.8
PESTICIDES	DDE	61.56	ND 34	58 *	110	ND 34

Test Name	Analytes	RSA Cterm	Sweetclover EC7-94-01	Sweetclover EC8-94-01	Sweetclover EC8-94-01 DUP	Sweetclover EC8-94-02
EXPLOSIVES	2,4,6-TRINITROTOLUENE	139.2	270	ND 220	ND 220	ND 220
PAH	BENZO [A] ANTHRACENE	0.25	ND 0.5	12	24	ND 0.5
	BENZO [K] FLUORANTHENE	0.225	ND 0.45	8.3	16	0.5
	CHRYSENE	0.3707	ND 0.62	15	29	1
	FLUORANTHENE	0.8689	1	30	53	2.2
	PHENANTHRENE	3.123	3.2	15	21	4.7
	PYRENE	0.3947	0.31 *	34	61	1.8

Test Name	Analytes	RSA Cterm	Beetle EL7-95-01C
PESTICIDES	DDT	0.215	2.5

Test Name	Analytes	RSA Cterm	Grasshopper EG7-95-01C	Grasshopper EG7-95-02C	Grasshopper EG7-95-03C	Grasshopper EG7-95-04C	Grasshopper EG7-95-05C
	No Detections for Grasshoppers in this Table.						

Note.—All values in $\mu g/kg$ (equal to ppb).
PAH=Polynuclear Aromatic Hydrocarbon.
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
*=Analyte concentration is less than Cterm.
DUP=Duplicate analysis.

selenium (0.19), and zinc (53). All five composite grasshopper samples, EG7-95-01C through -05C, reported detectable quantities of eight metals. The metals and the range of detects in ppm are as follows: aluminum (29.5 to 37.3), barium (1.6 to 2.6), cadmium (0.17 to 0.32), chromium (0.21 to 0.26), copper (20.4 to 25.0), iron (45.2 to 50.0), antimony (0.20 to 0.29), and zinc (58.0 to 61.6). In addition, cobalt was detected in samples EG7-95-02C, -03C, and -04C with a range of 0.08 to 0.09 ppm; arsenic in sample EG7-95-04C at 0.22 ppm; mercury in sample EG7-95-04C at 0.02 ppm; manganese in samples EG7-95-02C through -05C inclusive with a range of 4.0 to 5.4 ppm; nickel in sample EG7-95-01C at 0.51 ppm; lead in samples EG7-95-03C, -04C, and -05C with a range of 0.37 to 0.57 ppm; selenium in samples EG7-95-01C, -04C, and -05C with a range of 0.11 to 0.16 ppm; and vanadium in sample EG7-95-02C at 0.08 ppm.

Dioxins/Furans

The single rabbitbrush sample EB7-94-01 located at SWMU 12 had detectable concentrations of OCDD at 1.86 ppt.

SWMU 12 sweetclover sample EC7-94-01 had detectable quantities of OCDD (4.13 ppt), total PeCDF (0.48 ppt), and total TCDF at (0.80 ppt).

A variety of polychlorinated dibenzodioxins and dibenzofurans were reported from SWMU 15. Rabbitbrush sample EB8-94-02 had detectable quantities of 1234678-HpCDD (9.48 ppt), 1234678-HpCDF (1.80 ppt), 123789-HxCDD (0.83 ppt), 234678-HxCDF (0.41 ppt), 2378-TCDF (0.41 ppt), OCDD (79.15 ppt), OCDF (6.79 ppt), total HpCDF (3.90 ppt), total HxCDD (7.00 ppt), total HxCDF (2.25 ppt), PeCDF (0.59 ppt), and total TCDF (1.86 ppt). Sample EB8-94-03 had detectable quantities of 1234678-HpCDF (0.44 ppt), OCDF (1.41 ppt), total HpCDD (0.63 ppt), total HpCDF (0.44 ppt), total HxCDD (0.24 ppt), total TCDD (0.16 ppt), and total TCDF (0.15 ppt).

Sweetclover samples that had detectable quantities from SWMU 15 include EC8-94-01 and EC8-94-02. EC8-94-01 had detects from 1234678-HpCDD (1.23 ppt), OCDD (9.90 ppt), total HpCDD (2.97 ppt), total HpCDF (0.56 ppt), and total PeCDF (0.18 ppt). Sample EC2-94-02, had detectable values from OCDD (19.98 ppt), total HpCDD (2.59 ppt), and total HpCDF (1.22 ppt).

Grasshopper sample EG7-95-04C from SWMUs 12 and 15 had three detects of dioxins: 1234678HpCDD at 3.90 ppt; OCDD at 32.84 ppt; and total HpCDD at 3.90 ppt.

Explosives

The sweetclover sample at SWMU 12 (EC7-94-01) reported 270 ppb of 2,4,6-TNT.

The explosive 2,4,6-TNT was detected in two of the three rabbitbrush samples from SWMU 15: the EB8-94-01 result was 6,300 ppb, and the EB8-94-03 result was 7,800 ppb.

Grasshopper/beetle samples were not analyzed for explosives.

Herbicides

No herbicides were detected in SWMUs 12/15 biota samples. Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

Two of the three rabbitbrush samples from SWMU 15 had detectable quantities of 4,4'-DDE (samples EB8-94-01 at 58 ppb and -02 at 110 ppb).

The single beetle sample from SWMUs 12 and 15, EL7-95-01C, had a detectable quantity of 4,4'-DDT measured at 2.5 ppb.

PAHs

SWMU 12 rabbitbrush sample EB7-94-01 contained 2.6 ppb of fluoranthene, 20 ppb phenanthrene, and 0.89 ppb pyrene. Sweetclover sample EC7-94-01 analysis reported 1 ppb fluoranthene, 3.2 ppb phenanthrene, and 0.31 ppb pyrene. The three SWMU 15 rabbitbrush samples (EB8-94-01, -02, and -03) all reported quantities of chrysene (from 1.6 to 4.3 ppb), fluoranthene (from 3.7 to 20 ppb), phenanthrene (from 18 to 76 ppb), and pyrene (from 1.8 to 13 ppb). In addition, benzo(a)anthracene was detected in samples EB8-94-01 (0.68 ppb) and EB8-94-02 (0.93 ppb). Two SWMU 15 sweetclover samples, EC8-94-01 and -02, as well as the duplicate sample for EC8-94-01 had reportable quantities of benzo(k)fluoranthene (from 0.5 to 16 ppb), chrysene (from 1 to 29 ppb), fluoranthene (from 2.2 to 53 ppb), phenanthrene (from 4.7 to 21 ppb), and pyrene (from 1.8 to 61 ppb). Also, sample EC8-94-01 and its duplicate reported 12 ppb and 24 ppb, respectively, of benzo(a)anthracene. Gumweed sample EM8-94-03 had detectable quantities of chrysene (0.95 ppb), fluoranthene (3.9 ppb), phenanthrene (13 ppb), and pyrene (2.4 ppb).

Grasshopper/beetle samples were not analyzed for PAHs.

5.6 SWMU 21 - AED DEACTIVATION FURNACE

5.6.1 Soil Sample Results

Two surface soil samples (ES9-94-01 and duplicate and ES9-94-02) were collected at SWMU 21 at approximate locations of contamination previously identified by RFI soil sampling and analysis (Figure 5-5). These locations were along the western and northern perimeter of the Deactivation Furnace Building (Building 1320). The samples were analyzed for inorganics, dioxins/furans, pesticides/PCBs, explosives, and SVOCs. The results are summarized in Table 5-22.

Table 5-22. Summary of Soil Sample Analytical Results for the AED Deactivation Furnace (SWMU 21)

Test Name	Analytes	TEAD UBC	RSA UBC	ES9-94-01	ES9-94-01(D)	ES9-94-02
DIOXINS	OCTACHLORODIBENZODIOXIN	N/A	N/A	0.00049	0.000649	LT 0.0000933
METALS	ALUMINUM	28,083.	17,300.	7930*~	8820*~	6960*~
	ANTIMONY	15.	1.	24.6	33.5	1.66*
	ARSENIC	14.5	8.86	4.61*~	4.98*~	4.02*~
	BARIUM	247.1	134.	394	NT	91.6*~
	CADMIUM	0.847	1.2	20	38	1.47
	CALCIUM	114,483.	35,548.	14700*~	33100*~	14100*~
	CHROMIUM	20.62	22.6	17.6*~	NT	10.5*~
	COBALT	6.94	7.99	3.98*~	3.32*~	2.91*~
	COPPER	24.72	17.24	434	736	25.5
	IRON	22,731.	17,400.	10200*~	12800*~	9640*~
	LEAD	32.49	73.3	836	1700	59.5~
	MAGNESIUM	13,114.	6,311.	4920*~	6120*~	4340*~
	MANGANESE	698.3	499.	211*~	223*~	191*~
	MERCURY	0.0572	0.07	0.0578~	0.0685~	LT 0.05
	NICKEL	17.4	14.8	13.6*~	22.4	7.44*~
	POTASSIUM	5,449.	3,259.	2250*~	2120*~	2050*~
	SODIUM	632.	282.	125*~	122*~	123*~
	VANADIUM	28.39	24.3	11.4*~	12.1*~	13.2*~
	ZINC	102.8	127.	492	840	57*~
SEMIVOLATILES	FLUORANTHENE	N/A	N/A	LT 0.032	0.057	LT 0.032

Note.—All values in $\mu g/g$ (equal to ppm).

N/A=Not Applicable.

*=Analyte concentration is less than TEAD UBC.

~=Analyte concentration is less than RSA UBC.

LT=Analyte concentration is less than Certified Reporting Limit.

(D)=Duplicate analysis.

NT=Not Tested (or the sample was rejected).

Inorganics

Sample ES9-94-01 and its duplicate contained antimony (24.6 and 33.5 μg/g), barium (394 and 722 μg/g), cadmium (20 and 38 μg/g), copper (434 and 736 μg/g), lead (836 and 1,700 μg/g), and zinc (492 and 840 μg/g) that exceeded both TEAD and RSA UBCs. These concentrations, however, were much lower than the concentrations reported for the same analytes from these general locations in the previous RFI (e.g., lead at 63,000 μg/g). As with the previous RFI, however, lead exceeded the risk-based screening level for human health of 400 μg/g.

Metals concentrations for sample ES9-94-02, located north of the building, were at or slightly above background concentrations. Only cadmium and copper were found to exceed their corresponding UBCs. These results are in contrast to the previous RFI results, which indicated 11 metals were present above background concentrations.

Dioxins/Furans

OCDD (octachlorodibenzodioxin) was detected in ES9-94-01 and its duplicate at 0.49 and 0.64 ppb, respectively. OCDD was the only dioxin/furan compound detected at SWMU 21 as a result of this sampling. This is in contrast to the results of the previous RFI where numerous dioxin and furan compounds were detected.

Pesticides/PCBs

No pesticide or PCB compounds were detected.

Explosives

No explosive compounds were detected in the two samples. The explosive compounds, TNT and 2,4-dinitrotoluene, were previously detected in the area of ES9-94-01 at low concentrations.

SVOCs

A low concentration of fluoranthene was detected in the ES9-94-01 duplicate (0.057μg/g) but was not found in the original sample. The previous RFI also detected naphthalene, phenanthrene, pyrene, and N-nitrosodiphenylamine in the area of sample ES9-94-01.

5.6.2 Biota Sample Results

Two rabbitbrush samples (EB9-94-01 and -02) and two gumweed samples (EM9-94-01 and -02) were collected at SWMU 21. No jackrabbits were collected at this SWMU. Five *composite* grasshopper samples (EG9-95-01C through EG9-95-05C) and two *composite* beetle

samples (EL9-95-01C and EL9-95-02C) were collected at SWMUs 21 and 37. Tables 5-23 through 5-25 contain summaries of analytes detected in SWMU 21 biota.

Inorganics

Rabbitbrush sample EB9-94-01 from SWMU 21 contained 12 metals above detection limits, whereas sample EB9-94-02 contained 11. Arsenic at 0.28 ppm ("B" qualified), nickel at 0.92 ppm, and antimony at 1.3 ppm ("B") were detected only in sample EB9-94-01. Mercury at 0.01 and vanadium at 0.09 ppm ("B") were detected only in sample EB9-94-02. The remaining nine metals were detected in both samples including aluminum (81.2 and 66.3 ppm), barium (17.2 and 8.5 ppm), cadmium (0.77 and 0.18 ppm ("B")), chromium (0.66 and 0.19 ppm ("B")), copper (12.3 and 6.5 ppm), iron (87.3 and 65.2 ppm), manganese (12.5 and 8.5 ppm), lead (70.9 and 14.3 ppm), and zinc (23.6 and 13.3 ppm), respectively.

The two gumweed samples from SWMU 21, EM9-94-01 and -02, contained 13 and 11 metals above detection limits, respectively. Cobalt at 0.23 ppm ("B") and antimony at 3.4 ppm ("B") were detected only in sample EM9-94-01. The other 11 metals were detected in both samples as follows: aluminum (411 and 123 ppm), barium (120 and 33.2 ppm), cadmium (10.1 and 1.4 ppm), chromium (1.3 and 0.32 ppm), copper (53.6 and 14.9 pp,), iron (286 and 110 ppm), manganese (23.5 and 18.2), nickel (1.5 and 0.45 ppm ("B")), lead (147 and 29.3 ppm), vanadium (0.39 and 0.11 ppm (both values "B" qualified)), and zinc (154 and 50.7 ppm). Concentrations in sample EM9-94-01 were consistently higher than those detected in EM9-94-02.

Fifteen metals were detected in one of the composite beetle samples from SWMUs 21 and 37 (EL9-95-01C). The metals and their reported detection values in ppm are as follows: aluminum (71.0), arsenic (1.3), barium (6.6), cadmium (0.91), cobalt (0.09), chromium (0.32), copper (10.5), iron (93.7), mercury (0.03), manganese (7.4), nickel (0.45), lead (14.1), selenium (0.12), vanadium (0.1), and zinc (43.0). Four composite grasshopper samples from SWMUs 21 and 37, EG-95-01C through -04C, reported detectable quantities of 10 metals. The metals and the range of detects in ppm are as follows aluminum (27.4 to 37.5), barium (1.9 to 3.0), cadmium (0.34 to 0.60), chromium (0.21 to 0.24), copper (32.0 to 39.5), iron (45.5 to 54.5), manganese (4.3 to 5.7), lead (0.51 to 1.2), selenium (0.18 to 0.6), and zinc (55.3 to 60.6). In addition, cobalt was detected in samples EG9-95-02C and -04C at a value of 0.07 ppm; silver in sample EG9-95-01C at 0.09 ppm; and mercury in samples EG9-95-02C, -03C, and -04C at 0.01 ppm.

Dioxins/Furans

Rabbitbrush sample EB9-94-01 at SWMU 21 had the following dioxin/furan detects reported: 1234678-HpCDD at 24.16 ppt; 1234678-HpCDF at 2.28 ppt; 123478-HxCDD at 0.82 ppt; 123678-HxCDD at 1.16 ppt; 12378-PeCDD at 0.77 ppt; 123789-HxCDD at 2.99 ppt; 234678-HxCDF at 0.44 ppt (this compound was also detected in sample EB9-94-02 at 0.29 ppt); 2378-TCDF at 1.0 ppt; OCDD at 274.98 ppt (also in sample EB9-94-02 at 4.2 ppt); OCDF at 15.22 ppt; total HpCDD at 51.32 ppt; total HpCDF at 5.17 ppt; total HxCDD at 16.47 ppt; total

Table 5-23. *Summary of Biota Sample Metal Results for the AED Deactivation Furnace (SWMU 21)*

Test Name	Analytes	RSA Cterm	Beetle EL9-95-01C
METALS	ALUMINUM	194.	71 *
	ARSENIC	0.48	1.3
	BARIUM	2.6	6.6
	CADMIUM	0.15	0.91
	CHROMIUM	0.43	0.32 *
	COBALT	0.15	0.09 *
	COPPER	5.7	10.5
	IRON	213.	93.7 *
	LEAD	0.48	14.1
	MANGANESE	10.4	7.4 *
	MERCURY	0.01	0.03
	NICKEL	1.	0.45 *
	SELENIUM	0.13	0.12 *
	VANADIUM	0.31	0.1 *
	ZINC	43.2	43 *

Test Name	Analytes	RSA Cterm	Grasshopper EG9-95-01C	Grasshopper EG9-95-02C	Grasshopper EG9-95-03C	Grasshopper EG9-95-04C
METALS	ALUMINUM	62.43	28.9 *	27.4 *	37.5 *	34.9 *
	BARIUM	1.994	2	2.2	3	1.9 *
	CADMIUM	0.5006	0.36 *	0.46 *	0.6	0.34 *
	CHROMIUM	0.3676	0.24 *	0.24 *	0.21 *	0.24 *
	COBALT	0.1143	ND 0.066	0.07 *	ND 0.066	0.07 *
	COPPER	21.21	33.5	36.2	39.5	32
	IRON	79.76	51.3 *	45.5 *	54.5 *	52.8 *
	LEAD	0.523	0.6	1.2	0.89	0.51 *
	MANGANESE	6.523	4.3 *	4.7 *	5.7 *	4.7 *
	MERCURY	0.	ND 0.0095	0.01	0.01	0.01
	SELENIUM	0.2014	0.18 *	0.6	0.2 *	0.2 *
	SILVER	0.0581	0.09	ND 0.0838	ND 0.084	ND 0.0828
	ZINC	57.77	57 *	60.6	55.3 *	57.7 *

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
NV=Not a Valid Detect.
ND=Analyte not detected in sample.

Table 5-23. Summary of Biota Sample Metal Results for the AED Deactivation Furnace (SWMU 21) (continued)

Test Name	Analytes	RSA Cterm	Gumweed EM9-94-01	Gumweed EM9-94-02
METALS	ALUMINUM	199.3	411	123 *
	ANTIMONY	0.165	3.4	NV
	BARIUM	19.2	120	33.2
	CADMIUM	0.5765	10.1	1.4
	CHROMIUM	0.4501	1.3	0.32 *
	COBALT	0.0879	0.23	ND 0.0771
	COPPER	9.705	53.6	14.9
	IRON	176.2	286	110 *
	LEAD	1.428	147	29.3
	MANGANESE	39.97	23.5 *	18.2 *
	NICKEL	2.293	1.5 *	0.45 *
	VANADIUM	0.2452	0.39	0.11 *
	ZINC	21.31	154	50.7

Test Name	Analytes	RSA Cterm	Rabbitbrush EB9-94-01	Rabbitbrush EB9-94-02
METALS	ALUMINUM	106.6	81.2 *	66.3 *
	ANTIMONY	0.265	1.3	ND 0.5196
	ARSENIC	0.241	0.28	ND 0.2524
	BARIUM	4.672	17.2	8.5
	CADMIUM	0.3042	0.77	0.18 *
	CHROMIUM	0.2775	0.66	0.19 *
	COPPER	4.815	12.3	6.5
	IRON	103.5	87.3 *	65.2 *
	LEAD	1.631	70.9	14.3
	MANGANESE	33.68	12.5 *	8.5 *
	MERCURY	0.0134	ND 0.0099	0.01 *
	NICKEL	0.6769	0.92	ND 0.216
	VANADIUM	0.126	ND 0.0784	0.09 *
	ZINC	12.19	23.6	13.3

Table 5-24. Summary of Biota Sample Dioxin/Furans Results for the AED Deactivation Furnace (SWMU 21)

Test Name	Analytes	RSA Cterm	Gumweed EM9-94-01	Gumweed EM9-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	1.516	24.9242	1.5037 *
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.98	1.2563	ND 0.169
	OCTACHLORODIBENZODIOXIN	2.5	180.9806	10.3036
	OCTACHLORODIBENZOFURAN	1.11	10.1931	ND 0.282
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.9946	53.0554	3.0472
	TOTAL HEPTACHLORODIBENZOFURANS	0.909	3,9701	ND 0.158
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	1.066	12.8172	0.8708 *
	TOTAL HEXACHLORODIBENZOFURANS	0.3963	4.3905	0.6553
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.815	0.5544 *	ND 0.132
	TOTAL PENTACHLORODIBENZOFURANS	0.4507	1.1777	0.3373 *
	TOTAL TETRACHLORODIBENZOFURANS	1.254	ND 0.189	1.1056 *

Test Name	Analytes	RSA Cterm	Rabbitbrush EB9-94-01	Rabbitbrush EB9-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	24.1641	ND 0.43
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	2.2852	ND 0.182
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	1.03	0.8199 *	ND 0.298
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.845	1.1654	ND 0.249
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.743	2.9899	ND 0.27
	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	0.801	0.7734 *	ND 0.38
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.2849	0.4415	0.2938
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2301	1.0036	ND 0.106
	OCTACHLORODIBENZODIOXIN	4.11	274.9803	4.2003
	OCTACHLORODIBENZOFURAN	1.127	15.2196	ND 0.9
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	51.3163	ND 0.43
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	5.1721	ND 0.227
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.8575	16.4659	ND 0.271
	TOTAL HEXACHLORODIBENZOFURANS	1.145	2.2997	0.2938 *
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.3483	1.2846	ND 0.38
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	1.0464	0.2182 *
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	4.4087	ND 0.106

Table 5-24. Summary of Biota Sample Dioxin/Furans Results for the AED Deactivation Furnace (SWMU 21) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL9-95-01C	Beetle EL9-95-02C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.305	16.853	18.619
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.265	ND 1.231	0.7222
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.164	ND 0.848	0.3182
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.259	1.2684	1.69
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.2345	ND 0.93	1.4962
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.295	ND 0.517	0.281 *
	2,3,7,8 TETRACHLORODIBENZODIOXIN	0.4255	ND 0.512	0.2968 *
	OCTACHLORODIBENZODIOXIN	0.9155	NV	1.2693
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.305	29.4603	28.5352
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.252	7.7816	9.0379
	TOTAL HEXACHLORODIBENZOFURANS	0.08	1.0168	3.3728
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.4855	ND 0.82	2.3041
	TOTAL PENTACHLORODIBENZOFURANS	0.3085	ND 0.541	1.3834
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	50.04	ND 0.512	0.8736 *
	TOTAL TETRACHLORODIBENZOFURANS	0.3295	ND 0.446	0.4747

Test Name	Analytes	RSA Cterm	Grasshopper EG9-95-01C	Grasshopper EG9-95-02C	Grasshopper EG9-95-03C	Grasshopper EG9-95-04C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.7685	ND 3.353	1.6163	ND 3.928	1.9425
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.7685	ND 3.353	1.6163	ND 3.928	1.9425

Note.—All values in ng/kg (equal to ppt).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.
NV=Not a Valid Detect.

Table 5-25. Summary of Remaining Biota Sample Analytical Results for the AED Deactivation Furnace (SWMU 21)

Test Name	Analytes	RSA Cterm	Gumweed EM9-94-01	Gumweed EM9-94-02
PAH	CHRYSENE	0.345	0.98	ND 0.68999
	FLUORANTHENE	1.8	4.6	ND 3.6
	PHENANTHRENE	9.39	21	14
	PYRENE	0.9	2.3	ND 1.8

Test Name	Analytes	RSA Cterm	Rabbitbrush EB9-94-01	Rabbitbrush EB9-94-02
EXPLOSIVES	2,4,6-TRINITROTOLUENE	11,553.	11000 *	ND 5700
PAH	CHRYSENE	0.5024	0.96	ND 0.83
	FLUORANTHENE	2.227	3.9	4
	PHENANTHRENE	7.8	22	26
	PYRENE	0.78	1.2	1.2

Test Name	Analytes	RSA Cterm	Beetle EL9-95-01C
PESTICIDES	DDE	5.5	64
	DDT	0.215	1.4

Test Name	Analytes	RSA Cterm	Grasshopper EG9-95-01C	Grasshopper EG9-95-02C	Grasshopper EG9-95-03C	Grasshopper EG9-95-04C
PESTICIDES	DDT	0.4759	ND 0.43	2.7	ND 0.43	ND 0.43

Note.—All values in μg/kg (equal to ppb).
PAH=Polynuclear Aromatic Hydrocarbon.
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
*=Analyte concentration is less than Cterm.

HxCDF at 2.3 ppt (also in sample EB9-94-02 at 0.29 ppt); total PeCDD at 1.28 ppt; total PeCDF at 1.05 ppt (also in sample EB9-94-02 at 0.22 ppt); and total TCDF at 4.41 ppt.

Gumweed samples EM9-94-01 and -02 at SWMU 21 had detectable quantities of the following compounds: 1234678-HpCDD (24.92 and 1.5 ppt, respectively); OCDD (180.98 and 10.3 ppt); total HpCDD (53.06 and 3.05 ppt); total HxCDD (12.82 and 0.87 ppt); total HxCDF (4.39 and 0.66 ppt); and total PeCDF (1.18 and 0.34 ppt). In addition, sample EM9-94-01 had the following single detects; 123678-HxCDD (1.26 ppt); OCDF (10.19 ppt); total HpCDF (3.97 ppt); and total PeCDD (0.55 ppt). Sample EM9-94-02 also reported total TCDF at 1.11 ppt.

The two composite beetle samples from SWMUs 21 and 37 (EL9-95-01C and -02C) had several dioxin/furan detects. Analytes and values in ppt for sample EL9-95-01C are as follows: 1234678-HpCDD (16.85); 123678-HxCDD (1.27); total HpCDD (29.46); total HxCDD (7.78); and total HxCDF (1.02). Similar values for sample EL9-95-02C are 1234678-HpCDD (18.62); 123478-HxCDD (0.72); 123478-HxCDF (0.32); 123678HxCDD (1.69); 123789-HxCDD (1.50); 23478-PeCDF (0.28); 2378-TCDD (0.30); OCDD (1.27); total HpCDD (28.54); total HxCDD (9.04); total HxCDF (3.37); total PeCDD (2.30); total PeCDF (1.38); total TCDD (0.87); and total TCDF (0.47). SWMUs 21 and 37 grasshopper sample EG9-95-02C reported the same value of 1.62 ppt for 1234678-HpCDD and for total HpCDD. Similarly, grasshopper sample EG9-95-04C had a value of 1.94 ppt for 1234678-HpCDD and total HpCDD.

Explosives

The rabbitbrush sample from SWMU 21 (EB9-94-01) contained 11,000 ppb of 2,4,6-TNT.

Grasshopper/beetle samples were not analyzed for explosives.

Herbicides

No herbicides were detected in SWMU 21 biota samples. Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

Grasshopper sample EG9-95-02C showed a detect of 2.7 ppb of 4,4′-DDT. Beetle sample EL9-95-01C had reportable quantities of 4,4′-DDT (1.4 ppb) and 4,4′-DDE (64 ppb).

PAHs

Rabbitbrush sample EB9-94-01 had reportable quantities of chrysene (0.96 ppb), fluoranthene (3.9 ppb), phenanthrene (22 ppb), and pyrene (1.2 ppb). The other rabbitbrush sample EB9-94-02 had 4 ppb fluoranthene, 26 ppb phenanthrene, and 1.2 ppb pyrene. Gumweed sample EM9-94-01 analysis reported 0.98 ppb chrysene, 4.6 ppb fluoranthene, 21 ppb phenanthrene,

and 2.3 ppb pyrene. The second gumweed sample EM9-94-02 contained only phenanthrene at 14 ppb.

Grasshopper/beetle samples were not analyzed for PAHs.

5.7 SWMU 37 - CONTAMINATED WASTE PROCESSOR

5.7.1 Soil Sample Results

Two surface soil samples (ESA-94-01 and duplicate and ESA-94-02) were collected at SWMU 37 at approximate locations of contamination previously identified by RFI investigations (Figure 5-6). These locations are located near the dust and ash collection equipment on the south side of Building 1325A (ESA-94-01) and northwest of the building near a culvert (ESA-94-02). Previously identified contamination primarily consisted of dioxins/furans and SVOCs. The current samples were analyzed for inorganics, dioxins/furans, pesticides/PCBs, explosives, and SVOCs. Results are summarized in Table 5-26.

Inorganics

No inorganics were found to exceed TEAD or RSA UBCs.

Dioxins/Furans

Both samples, including the duplicate analysis, contained 6,7,8-HPD (1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin) with concentrations ranging from 0.34 ppb to 0.64 ppb. In addition, ESA-94-01 and its duplicate contained 7,8,9-HXD (1,2,3,7,8,9-hexachlorodibenzo-p-dioxin) at 0.1 and 0.06 ppb, respectively. TCDD was detected in ESA-94-02 at 0.01 ppb. OCDD was detected in ESA-94-01 and its duplicate, and ESA-94-02 at concentrations of 2.82, 2.01, and 2.08 ppb, respectively. These detections are consistent with previously detected dioxin and furan compounds at SWMU 37.

Pesticides/PCBs

Dieldrin was confirmed in ESA-94-02 at 0.0197 μg/g. Beta-endosulfan was confirmed in ESA-94-01 at 0.00263 μg/g but was reported with a 'U' flag code in ESA-94-02. Endosulfan sulfate and endrin ketone were both reported as unconfirmed in ESA-94-02. The previous RFI did not analyze for pesticides.

Explosives

No explosive compounds were detected. The previous RFI sample collected in the area of ESA-94-02 contained a low detect of 2,4,6-trinitrotoluene. No other previous samples were found to contain explosives.

Table 5-26. *Summary of Soil Sample Analytical Results for the Contaminated Waste Processor (SWMU 37)*

Test Name	Analytes	TEAD UBC	RSA UBC	ESA-94-01	ESA-94-01(D)	ESA-94-02
DIOXINS	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	N/A	N/A	0.000642	0.000383	0.000348
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	N/A	N/A	0.0001	0.0000621	LT 0.0000628
	2,3,7,8 TETRACHLORODIBENZODIOXIN	N/A	N/A	LT 0.0000233	LT 0.0000151	0.0000168
	OCTACHLORODIBENZODIOXIN	N/A	N/A	0.00282	0.00201	0.00208
METALS	ALUMINUM	28,083.	17,300.	4890*-	4770*-	4110*-
	ARSENIC	14.5	8.86	3.69*-	3.68*-	3.78*-
	BARIUM	247.1	134.	60.5*-	52.6*-	46*-
	CALCIUM	114,483.	35,548.	27700*-	24500*-	24900*-
	CHROMIUM	20.62	22.6	8.59*-	11.9*-	7.96*-
	COBALT	6.94	7.99	2.92*-	3.1*-	LT 2.5
	COPPER	24.72	17.24	6.58*-	7.26*-	9.18*-
	IRON	22,731.	17,400.	8170*-	8060*-	7860*-
	LEAD	32.49	73.3	LT 7.44	LT 7.44	8.11*-
	MAGNESIUM	13,114.	6,311.	4500*-	3950*-	3650*-
	MANGANESE	698.3	499.	139*-	119*-	103*-
	NICKEL	17.4	14.8	6.42*-	5.67*-	5.15*-
	POTASSIUM	5,449.	3,259.	1420*-	1080*-	891*-
	SODIUM	632.	282.	119*-	105*-	113*-
	VANADIUM	28.39	24.3	11.1*-	12*-	10.9*-
	ZINC	102.8	127.	37.2*-	40.5*-	41.1*-

Table 5-26. *Summary of Soil Sample Analytical Results for the Contaminated Waste Processor (SWMU 37) (continued)*

Test Name	Analytes	TEAD UBC	RSA UBC	ESA-94-01	ESA-94-01(D)	ESA-94-02
SEMIVOLATILES	BENZO [A] ANTHRACENE	N/A	N/A	0.12	0.1	1.2
	BENZO [B] FLUORANTHENE	N/A	N/A	LT 0.31	LT 0.31	2.3
	BENZO [G,H,I] PERYLENE	N/A	N/A	LT 0.18	LT 0.18	0.58
	BENZO [K] FLUORANTHENE	N/A	N/A	LT 0.13	LT 0.13	0.71
	CHRYSENE	N/A	N/A	0.2	0.2	1.4
	FLUORANTHENE	N/A	N/A	0.18	0.17	1.9
	PHENANTHRENE	N/A	N/A	0.17	0.15	2.1
	PYRENE	N/A	N/A	0.24	0.21	2.7
PESTICIDES/PCBS	BETA-ENDOSULFAN	N/A	N/A	0.00263	LT 0.0007	0.00584
	DIELDRIN	N/A	N/A	LT 0.0016	LT 0.0016	0.0197
	ENDOSULFAN SULFATE	N/A	N/A	ND 0.0005	ND 0.0005	0.000793
	ENDRIN KETONE	N/A	N/A	ND 0.0005	ND 0.0005	0.00116

Note.—All values in $\mu g/g$ (equal to ppm).
N/A=Not Applicable.
LT=Analyte concentration is less than Certified Reporting Limit.
*=Analyte concentration is less than TEAD UBC.
ˉ=Analyte concentration is less than RSA UBC.
(D)=Duplicate analysis.
ND=Analyte not detected in sample.

SVOCs

Both samples were found to contain several SVOCs. ESA-92-02 contained the greatest number of SVOCs, including benzo[a]anthracene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, endrin ketone, fluoranthene, phenanthrene, and pyrene in concentrations ranging from 0.71 $\mu g/g$ for benzo(k)fluoranthene to 2.7 $\mu g/g$ for pyrene.

Sample ESA-94-01 contained five of the SVOCs contained in ESA-94-02 at concentrations ranging from 0.12 $\mu g/g$ to 0.24 $\mu g/g$. These compounds are mainly PAHs that are commonly found in incinerator ash. None of the SVOCs were at levels exceeding risk-based criteria for human health.

5.7.2 Biota Sample Results

Two rabbitbrush samples (EBA-94-01 and EBA-94-02), two sweetclover samples (ECA-94-01 and ECA-94-02), and one ambrosia sample (EAA-94-02) were collected at SWMU 37. No jackrabbits were collected at this SWMU. The single ambrosia was analyzed due to the lack of additional samples that could be collected at this SWMU; however, the data for this sample should be judged as semi-quantitative since an MDL study was not performed on this matrix. Five *composite* grasshopper samples (EG9-95-01C through EG9-95-05C) and two *composite* beetle samples (EL9-95-01C and EL9-95-02C) were collected at SWMUs 21 and 37. Analyte concentrations for SWMU 37 biota are summarized in Tables 5-27 through 5-29.

Inorganics

The two rabbitbrush samples (EBA-94-01 and -02) each contained 12 metals above detection limits. Cadmium at 0.22 ppm ("B") was detected only in EBA-94-01, whereas cobalt at 0.10 ppm ("B") was detected only in EBA-94-02. The remaining 11 metals and their respective concentrations are as follows: aluminum (90.6 and 183 ppm), arsenic (0.32 and 0.36 ppm) (both values "B" qualified), barium (7.0 ppm for both samples), chromium (0.35 and 0.53 ppm), copper (8.4 and 7.2 ppm), iron (120 and 185 ppm), manganese (16.4 and 14.6 ppm), nickel (2.4 and 0.36 ppm ("B")), lead (1.8 and 0.41 ppm), vanadium (0.11 and 0.32 ppm) (both values "B" qualified), and zinc (12.4 and 25.7 ppm).

The two sweetclover samples (ECA-94-01 and -02) also each contained 12 metals above detection limits. As with the rabbitbrush samples, cadmium was detected only in sample ECA-94-01 at 0.22 ppm, whereas cobalt was detected only in ECA-94-02 at 0.08 ppm ("B"). The remaining 11 metals were detected in both samples as follows: aluminum (57.3 and 47.7 ppm), arsenic (0.41 and 0.31 ppm) (both values "B" qualified), barium (23.1 and 11.4), chromium (0.32 and 0.24 ppm), copper (4.2 and 3.3 ppm), iron (82.3 and 63.6 ppm), mercury (0.01 in both samples), manganese (12.3 and 16.0 ppm), nickel (0.54 and 0.26 ppm) (both values "B" qualified), lead (0.70 and 0.33 ppm), and zinc (7.1 and 10.7 ppm), respectively.

Table 5-27. *Summary of Biota Sample Metal Results for the Contaminated Waste Processor (SWMU 37)*

Test Name	Analytes	RSA Cterm	Rabbitbrush EBA-94-01	Rabbitbrush EBA-94-02
METALS	ALUMINUM	106.6	90.6 *	183
	ARSENIC	0.241	0.32	0.36
	BARIUM	4.672	7	7
	CADMIUM	0.3042	0.22 *	ND 0.1048
	CHROMIUM	0.2775	0.35	0.53
	COBALT	0.048	ND 0.0956	0.1
	COPPER	4.815	8.4	7.2
	IRON	103.5	120	185
	LEAD	1.631	1.8	0.41 *
	MANGANESE	33.68	16.4 *	14.6 *
	NICKEL	0.6769	2.4	0.36 *
	VANADIUM	0.126	0.11 *	0.32
	ZINC	12.19	12.4	25.7

Test Name	Analytes	RSA Cterm	Sweetclover ECA-94-01	Sweetclover ECA-94-02
METALS	ALUMINUM	40.95	57.3	47.7
	ARSENIC	0.2804	0.41	0.31
	BARIUM	15.43	23.1	11.4 *
	CADMIUM	0.082	0.22	ND 0.1226
	CHROMIUM	0.2522	0.32	0.24 *
	COBALT	0.0958	ND 0.0717	0.08 *
	COPPER	5.9	4.2 *	3.3 *
	IRON	47.33	82.3	63.6
	LEAD	0.5018	0.7	0.33 *
	MANGANESE	11.2	12.3	16
	MERCURY	0.0121	0.01 *	0.01 *
	NICKEL	0.634	0.54 *	0.26 *
	ZINC	6.422	7.1	10.7

Table 5-27. Summary of Biota Sample Metal Results for the Contaminated Waste Processor (SWMU 37) (continued)

Test Name	Analytes	RSA Cterm	Ambrosia EAA-94-02
METALS	ALUMINUM	N/A	92.5
	BARIUM	N/A	8.3
	BERYLLIUM	N/A	0.01
	CHROMIUM	N/A	0.48
	COBALT	N/A	0.08
	COPPER	N/A	9.1
	IRON	N/A	102
	LEAD	N/A	0.37
	MANGANESE	N/A	9.5
	NICKEL	N/A	2.6
	VANADIUM	N/A	0.15
	ZINC	N/A	37.5

Table 5-27. Summary of Biota Sample Metal Results for the Contaminated Waste Processor (SWMU 37) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL9-95-01C
METALS	ALUMINUM	194.	71 *
	ARSENIC	0.48	1.3
	BARIUM	2.6	6.6
	CADMIUM	0.15	0.91
	CHROMIUM	0.43	0.32 *
	COBALT	0.15	0.09 *
	COPPER	5.7	10.5
	IRON	213.	93.7 *
	LEAD	0.48	14.1
	MANGANESE	10.4	7.4 *
	MERCURY	0.01	0.03
	NICKEL	1.	0.45 *
	SELENIUM	0.13	0.12 *
	VANADIUM	0.31	0.1 *
	ZINC	43.2	43 *

Test Name	Analytes	RSA Cterm	Grasshopper EG9-95-01C	Grasshopper EG9-95-02C	Grasshopper EG9-95-03C	Grasshopper EG9-95-04C
METALS	ALUMINUM	62.43	28.9 *	27.4 *	37.5 *	34.9 *
	BARIUM	1.994	2	2.2	3	1.9 *
	CADMIUM	0.5006	0.36 *	0.46 *	0.6	0.34 *
	CHROMIUM	0.3676	0.24 *	0.24 *	0.21 *	0.24 *
	COBALT	0.1143	ND 0.066	0.07 *	ND 0.066	0.07 *
	COPPER	21.21	33.5	36.2	39.5	32
	IRON	79.76	51.3 *	45.5 *	54.5 *	52.8 *
	LEAD	0.523	0.6	1.2	0.89	0.51 *
	MANGANESE	6.523	4.3 *	4.7 *	5.7 *	4.7 *
	MERCURY	0.	ND 0.0095	0.01	0.01	0.01
	SELENIUM	0.2014	0.18 *	0.6	0.2 *	0.2 *
	SILVER	0.0581	0.09	ND 0.0838	ND 0.084	ND 0.0828
	ZINC	57.77	57 *	60.6	55.3 *	57.7 *

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.
N/A=No Ambrosia collected at the RSA, therefore the Cterm is not available.

Table 5-28. Summary of Biota Sample Dioxin/Furans Results for the Contaminated Waste Processor (SWMU 37)

Test Name	Analytes	RSA Cterm	Sweetclover ECA-94-01	Sweetclover ECA-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9342	37.4622	7.8875
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.2923	2.4286	ND 0.789
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3511	1.1642	ND 0.374
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.2872	3.4611	0.6519
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.1894	0.631	ND 0.298
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.2824	5.4521	0.9526
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3477	1.0661	ND 0.359
	OCTACHLORODIBENZODIOXIN	7.662	97.6693	31.3951
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.616	66.0179	15.846
	TOTAL HEPTACHLORODIBENZOFURANS	2.184	5.4708	ND 0.661
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.5397	32.105	3.8518
	TOTAL HEXACHLORODIBENZOFURANS	0.9658	7.0236	0.6207 *
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.3515	8.3401	ND 0.421
	TOTAL PENTACHLORODIBENZOFURANS	0.2157	4.0531	ND 0.241
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.1402	0.7887	ND 0.245
	TOTAL TETRACHLORODIBENZOFURANS	0.3733	2.2264	ND 0.196

Test Name	Analytes	RSA Cterm	Ambrosia EAA-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	N/A	10.3123
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	N/A	0.661
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	N/A	0.2303
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	N/A	0.8018
	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	N/A	0.3591
	OCTACHLORODIBENZODIOXIN	N/A	30.1586
	OCTACHLORODIBENZOFURAN	N/A	1.2665
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	N/A	18.892
	TOTAL HEPTACHLORODIBENZOFURANS	N/A	0.9239
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	N/A	7.0941
	TOTAL HEXACHLORODIBENZOFURANS	N/A	1.7598
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	N/A	0.5993
	TOTAL PENTACHLORODIBENZOFURANS	N/A	0.76459
	TOTAL TETRACHLORODIBENZOFURANS	N/A	0.2402

Table 5-28. Summary of Biota Sample Dioxin/Furans Results for the Contaminated Waste Processor (SWMU 37) (continued)

Test Name	Analytes	RSA Cterm	Rabbitbrush EBA-94-01	Rabbitbrush EBA-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	43.2992	23.2212
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	2.6149	1.4464
	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	1.299	0.7616 *	ND 0.121
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	1.03	2.6946	1.4314
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3154	1.0362	0.3882
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.845	3.3878	1.8125
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.4985	0.5009	0.23 *
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.743	6.0605	2.9613
	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	0.801	1.7951	0.9228
	1,2,3,7,8-PENTACHLORODIBENZOFURAN	0.5115	ND 0.192	0.0887 *
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.2849	0.9571	0.5295
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.5155	0.3729 *	ND 0.075
	2,3,7,8 TETRACHLORODIBENZODIOXIN	0.3595	0.2821 *	0.1716 *
	OCTACHLORODIBENZODIOXIN	4.11	141.5031	78.7147
	OCTACHLORODIBENZOFURAN	1.127	6.6481	3.5728
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	80.9673	46.6989
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	6.4944	3.3245
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.8575	38.8834	21.2327
	TOTAL HEXACHLORODIBENZOFURANS	1.145	6.7596	2.3653
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.3483	NV	5.4867
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	4.8575	1.1321
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.203	1.5427	0.7873
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	NV	0.5557

Table 5-28. *Summary of Biota Sample Dioxin/Furans Results for the Contaminated Waste Processor (SWMU 37) (continued)*

Test Name	Analytes	RSA Cterm	Beetle EL9-95-01C	Beetle EL9-95-02C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.305	16.853	18.619
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.265	ND 1.231	0.7222
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.164	ND 0.848	0.3182
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.259	1.2684	1.69
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.2345	ND 0.93	1.4962
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.295	ND 0.517	0.281 *
	2,3,7,8 TETRACHLORODIBENZODIOXIN	0.4255	ND 0.512	0.2968 *
	OCTACHLORODIBENZODIOXIN	0.9155	NV	1.2693
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.305	29.4603	28.5352
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.252	7.7816	9.0379
	TOTAL HEXACHLORODIBENZOFURANS	0.08	1.0168	3.3728
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.4855	ND 0.82	2.3041
	TOTAL PENTACHLORODIBENZOFURANS	0.3085	ND 0.541	1.3834
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	50.04	ND 0.512	0.8736 *
	TOTAL TETRACHLORODIBENZOFURANS	0.3295	ND 0.446	0.4747

Test Name	Analytes	RSA Cterm	Grasshopper EG9-95-01C	Grasshopper EG9-95-02C	Grasshopper EG9-95-03C	Grasshopper EG9-95-04C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.7685	ND 3.353	1.6163	ND 3.928	1.9425
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.7685	ND 3.353	1.6163	ND 3.928	1.9425

Note.—All values in ng/kg (equal to ppt).
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
NV=Not a Valid Detect.
*=Analyte concentration is less than Cterm.
N/A=No Ambrosia collected at the RSA, therefore the Cterm is not available.

Table 5-29. *Summary of Remaining Biota Sample Analytical Results for the Contaminated Waste Processor (SWMU 37)*

Test Name	Analytes	RSA Cterm	Rabbitbrush EBA-94-01	Rabbitbrush EBA-94-02
PAH	BENZO [A] ANTHRACENE	0.18	2.3	4.9
	BENZO [K] FLUORANTHENE	0.405	3.4	6.3
	CHRYSENE	0.5024	7.4	15
	FLUORANTHENE	2.227	21	38
	PHENANTHRENE	7.8	38	72
	PYRENE	0.78	14	29

Test Name	Analytes	RSA Cterm	Sweetclover ECA-94-01	Sweetclover ECA-94-02
PAH	BENZO [A] ANTHRACENE	0.25	2.3	1.5
	BENZO [K] FLUORANTHENE	0.225	2.6	2.3
	CHRYSENE	0.3707	5.5	6.7
	FLUORANTHENE	0.8689	13	13
	PHENANTHRENE	3.123	9.4	11
	PYRENE	0.3947	9	8.4

Test Name	Analytes	RSA Cterm	Ambrosia EAA-94-02
PAH	BENZO [K] FLUORANTHENE	N/A	5.7
	CHRYSENE	N/A	8.4
	FLUORANTHENE	N/A	21
	PHENANTHRENE	N/A	18
	PYRENE	N/A	17

Test Name	Analytes	RSA Cterm	Beetle EL9-95-01C
PESTICIDES	DDE	5.5	64
	DDT	0.215	1.4

Test Name	Analytes	RSA Cterm	Grasshopper EG9-95-01C	Grasshopper EG9-95-02C	Grasshopper EG9-95-03C	Grasshopper EG9-95-04C
PESTICIDES	DDT	0.4759	ND 0.43	2.7	ND 0.43	ND 0.43

Note.—All values in μg/kg (equal to ppb).
PAH=Polynuclear Aromatic Hydrocarbon.
RSA=Reference Study Area.
Cterm=Concentration Term.
N/A=No Ambrosia collected at the RSA, therefore the Cterm is not available.
ND=Analyte not detected in sample.

The one ambrosia sample from SWMU 37 (EAA-94-02) contained 12 metals above detection limits, including aluminum (92.5 ppm), barium (8.3 ppm), beryllium (0.01 ppm ("B")), cobalt (0.08 ppm) ("B"), chromium (0.48 ppm), copper (9.1 ppm), iron (102 ppm), manganese (9.5 ppm), nickel (2.6 ppm), lead (0.37 ppm), vanadium (0.15 ppm ("B")), and zinc (37.5 ppm).

Refer to Section 5.6.2, SWMU 21, Biota Sample Results for discussion of grasshopper and beetle analyses.

Dioxins/Furans

There were numerous dioxin/furan compounds detected in both rabbitbrush samples analyzed from SWMU 37. The samples EBA-94-01 and -02 had results as follows: 1234678-HpCDD (43.3 and 23.22 ppt); 1234678-HpCDF (2.61 and 1.45 ppt); 123478-HxCDD (2.69 and 1.43 ppt); 123478-HxCDF (1.04 and 0.39 ppt); 123678-HxCDD (3.39 and 1.81 ppt); 123678-HxCDF (0.5 and 0.23 ppt); 12378-PeCDD (1.8 and 0.92 ppt); 123789-HxCDD (6.06 and 2.96 ppt); 234678-HxCDF (0.96 and 0.53 ppt); 2378-TCDD (0.28 and 0.17 ppt); OCDD (141.5 and 78.71 ppt); OCDF (6.65 and 3.57 ppt); total HpCDDs (80.97 and 46.7 ppt); total HpCDFs (6.49 and 3.32 ppt); total HxCDDs (38.88 and 21.23 ppt); total HxCDFs (6.76 and 2.36 ppt); total PeCDFs (4.86 and 1.13 ppt); and total TCDD (1.54 and 0.79 ppt). In addition, the following single detects were reported for sample EBA-94-01: 1234789-HpCDF at 0.76 ppt and 23478-PeCDF at 0.37 ppt. Sample EBA-94-02 had the following single detects: 12378-PeCDF at 0.09 ppt, total PeCDD at 5.49 ppt, and total TCDF at 0.56 ppt.

Sweetclover samples ECA-94-01 and -02 at SWMU 37 each had detectable quantities of the following compounds: 1234678-HpCDD at 37.46 and 7.89 ppt; 123678-HxCDD at 3.46 and 0.65 ppt; 123789-HxCDD at 5.45 and 0.95 ppt; OCDD at 97.67 and 31.4 ppt; total HpCDDs at 66.02 and 15.85 ppt; total HxCDDs at 32.1 and 3.85 ppt; and total HxCDFs at 7.02 and 0.62 ppt, respectively. In addition, sample ECA-94-01 had the following single detects: 123478-HxCDD at 2.43 ppt; 123478-HxCDF at 1.16 ppt; 123678-HxCDF at 0.63 ppt; 234678-HxCDF at 1.07 ppt; total HpCDF at 5.47 ppt; total PeCDDs at 8.34 ppt; total PeCDFs at 4.05 ppt; total TCDD at 0.79 ppt; and total TCDF at 2.23 ppt.

The ambrosia sample at SWMU 37 (EAA-94-02) had the following detectable quantities reported: 1234678-HpCDD at 10.31 ppt; 123478-HxCDD at 0.66 ppt; 123478-HxCDF at 0.23 ppt; 123678-HxCDD at 0.8 ppt; 12378-PeCDD at 0.36 ppt; OCDD at 30.16 ppt; OCDF at 1.27 ppt; total HpCDD at 18.89 ppt; total HpCDF at 0.92 ppt; total HxCDD at 7.09 ppt; total HxCDF at 1.76 ppt; total PeCDD at 0.6 ppt; total PeCDF at 0.76 ppt; and total TCDF at 0.24 ppt.

Refer to Section 5.6.2, SWMU 21, Biota Sample Results, for the discussion of grasshopper and beetle analyses.

Explosives

No explosives were detected in SWMU 37 biota samples. Grasshopper/beetle samples were

not analyzed for explosives.

Herbicides

No herbicides were detected in SWMU 37 biota samples. Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

See Section 5.6.2, SWMU 21 Biota Sample Results, for the discussion of grasshopper and beetle analyses.

PAHs

Ambrosia sample EAA-94-02 analysis had the following detections: chrysene (8.4 ppb), benzo(k)fluoranthene (5.7 ppb), fluoranthene (21 ppb), phenanthrene (18 ppb), and pyrene (17 ppb). The two rabbitbrush samples (EBA-94-01 and 02) had reportable quantities of benzo(a)anthracene (2.3 and 4.9 ppb, respectively); benzo(k)fluoranthene (3.4 and 6.3 ppb); chrysene (7.4 and 15 ppb); fluoranthene (21 and 38 ppb); phenanthrene (38 and 72 ppb); and pyrene (14 and 29 ppb, respectively). Similarly, the two sweetclover samples (ECA-94-01 and -02) reported 2.3 and 1.5 ppb, respectively, of benzo(a)anthracene; 2.6 and 2.3 ppb of benzo(k)fluoranthene; 5.5 and 6.7 ppb of chrysene; 13 and 13 ppb of fluoranthene; 9.4 and 11 ppb of phenanthrene; and 9 and 8.4 ppb, respectively, of pyrene.

Grasshopper/beetle samples were not analyzed for PAHs.

5.8 SWMU 1b - BURN PADS

5.8.1 Soil Sample Results

Two surface soil samples (ES3-94-01 and ES3-94-02 and duplicate) were collected at SWMU 1b at approximate locations of contamination previously identified by RFI investigations (Figure 5-7). These locations correspond with previous test pit locations from areas containing evidence of burned debris. The samples were analyzed for inorganics, dioxins/furans, pesticides/PCBs, explosives, and SVOCs. Results are summarized in Table 5-30.

Inorganics

Cadmium was the only metal that exceeded both TEAD and RSA UBCs in the above two samples (1.93 to μg/g to 5.19 μg/g). Metals exceeding background from the previous RFI (barium, cadmium, copper, lead, silver, and zinc) were detected at 3.5 feet in the area of sample ES3-94-01 and at 7 feet in the area of ES3-94-02. The current surface soil sample

Table 5-30. Summary of Soil Sample Analytical Results for the Burn Pads (SWMU 1b)

Test Name	Analytes	TEAD UBC	RSA UBC	ES3-94-01	ES3-94-02	ES3-94-02(D)
DIOXINS	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	N/A	N/A	LT 0.0000073	LT 0.000014	0.0000403
	OCTACHLORODIBENZODIOXIN	N/A	N/A	0.00021	0.000197	0.000228
METALS	ALUMINUM	28,083.	17,300.	5870*˜	11100*˜	10100*˜
	ARSENIC	14.5	8.86	LT 2.5	3.22*˜	3.11*˜
	BARIUM	247.1	134.	69.4*˜	171*	154*
	BERYLLIUM	1.455	0.82	LT 0.427	0.566*˜	0.524*˜
	CADMIUM	0.847	1.2	1.93	5.06	5.19
	CALCIUM	114,483.	35,548.	5380*˜	13400*˜	14700*˜
	CHROMIUM	20.62	22.6	9.34*˜	14.6*˜	13.2*˜
	COBALT	6.94	7.99	LT 2.5	3.78*˜	4.22*˜
	COPPER	24.72	17.24	15.2*˜	17.1*˜	17.9*
	IRON	22,731.	17,400.	8150*˜	12600*˜	12500*˜
	LEAD	32.49	73.3	28.6*˜	20.8*˜	31.1*˜
	MAGNESIUM	13,114.	6,311.	2180*˜	5070*˜	4970*˜
	MANGANESE	698.3	499.	158*˜	290*˜	288*˜
	NICKEL	17.4	14.8	5.97*˜	8.42*˜	7.84*˜
	POTASSIUM	5,449.	3,259.	1550*˜	3500*	3180*˜
	SODIUM	632.	282.	112*˜	200*˜	184*˜
	VANADIUM	28.39	24.3	10.3*˜	19.1*˜	17.9*˜
	ZINC	102.8	127.	52.3*˜	99.9*˜	101*˜
PESTICIDES/PCBS	ENDRIN ALDEHYDE	N/A	N/A	0.00227	ND 0.0005	ND 0.0005

Note.—All values in $\mu g/g$ (equal to ppm).

N/A=Not Applicable.

LT=Analyte concentration is less than Certified Reporting Limit.

*=Analyte concentration is less than TEAD UBC.

˜=Analyte concentration is less than RSA UBC.

ND=Analyte not detected in sample.

(D)=Duplicate analysis.

results generally confirm the previous surface soil sample results that indicated no metals were above background concentrations at the surface and that contamination was restricted to subsurface soils corresponding to the former pits.

Dioxins/Furans

The compound 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin was detected in the duplicate of sample ES3-94-02 at a concentration of 0.04 ppb but was not detected in the original sample. OCDD was detected in both ES3-94-01 and ES3-94-02 (and duplicate) at concentrations of 0.21 ppb, 0.19 ppb, and 0.22 ppb, respectively. The corresponding samples collected during the previous RFI were not analyzed for dioxins/furans.

Pesticides/PCBs

An unconfirmed detection of endrin aldehyde was reported for ES3-94-01.

Explosives

No explosive compounds were detected.

SVOCs

No SVOCs were detected.

5.8.2 Biota Sample Results

Two rabbitbrush samples (EB3-94-01 and -02), two gumweed samples (EM3-94-01 and -02), and two sand dropseed samples (ED3-94-01 and -02) were collected at SWMU 1b. No quantitative data were obtained on the sand dropseed samples because of the lack of RSA comparison material and the small amount of sample gathered. No jackrabbits were collected at this SWMU. Tables 5-31 through 5-33 summarize SWMU 1b biota analytes. Three *composite* grasshopper samples (EG3-95-01C through EG3-95-03C) and one *composite* beetle sample (EL3-95-01) were collected at SWMUs 1b and 1c.

Inorganics

The rabbitbrush samples (EB3-94-01 and -02) contained 11 and 13 metals above detection limits, respectively. Arsenic (0.25 ppm ("B")), cobalt (0.10 ppm ("B")), and vanadium (0.10 ppm ("B")) were detected only in EB3-94-02. Mercury (0.01 ppm) was detected only in EB3-94-01. The remaining 10 metals were detected in both samples as follows: aluminum (43.9 and 50.0 ppm), barium (7.6 and 9.2 ppm), cadmium (0.43 and 0.22 ppm) (both values "B" qualified), chromium (0.22 ppm in both samples), copper (6.6 and 4.2 ppm), iron (58.4 and 64.9 ppm), manganese (24.4 and 42.6 ppm), nickel (0.57 and 0.60 ppm) (both values "B" qualified), lead (0.49 and 0.35 ppm), and zinc (51.4 and 5.9 ppm), respectively.

Table 5-31. Summary of Biota Sample Metal Results for the Burn Pads (SWMU 1b)

Test Name	Analytes	RSA Cterm	Gumweed EM3-94-01	Gumweed EM3-94-02
METALS	ALUMINUM	199.3	266	265
	BARIUM	19.2	17.3 *	16.9 *
	CADMIUM	0.5765	ND 0.3942	4
	CHROMIUM	0.4501	0.39 *	0.47
	COBALT	0.0879	0.08 *	0.09
	COPPER	9.705	10.3	5.7 *
	IRON	176.2	196	198
	LEAD	1.428	0.6 *	1.7
	MANGANESE	39.97	27.2 *	23.6 *
	NICKEL	2.293	0.52 *	0.46 *
	VANADIUM	0.2452	0.26	0.35
	ZINC	21.31	21.7	54.7

Test Name	Analytes	RSA Cterm	Rabbitbrush EB3-94-01	Rabbitbrush EB3-94-02
METALS	ALUMINUM	106.6	43.9 *	50 *
	ARSENIC	0.241	ND 0.2364	0.25
	BARIUM	4.672	7.6	9.2
	CADMIUM	0.3042	0.43	0.22 *
	CHROMIUM	0.2775	0.22 *	0.22 *
	COBALT	0.048	ND 0.09429	0.1
	COPPER	4.815	6.6	4.2 *
	IRON	103.5	58.4 *	64.9 *
	LEAD	1.631	0.49 *	0.35 *
	MANGANESE	33.68	24.4 *	42.6
	MERCURY	0.0134	0.01 *	ND 0.01
	NICKEL	0.6769	0.57 *	0.6 *
	VANADIUM	0.126	ND 0.0786	0.1 *
	ZINC	12.19	51.4	5.9 *

Table 5-31. *Summary of Biota Sample Metal Results for the Burn Pads (SWMU 1b) (continued)*

Test Name	Analytes	RSA Cterm	Beetle EL3-95-01C
METALS	ALUMINUM	194.	135 *
	ANTIMONY	0.21	0.26
	ARSENIC	0.48	0.4 *
	BARIUM	2.6	10
	BERYLLIUM	0.01	0.01
	CADMIUM	0.15	0.42
	CHROMIUM	0.43	0.51
	COBALT	0.15	0.16
	COPPER	5.7	7
	IRON	213.	150 *
	LEAD	0.48	0.85
	MANGANESE	10.4	14.4
	MERCURY	0.01	0.02
	NICKEL	1.	0.87 *
	VANADIUM	0.31	0.19 *
	ZINC	43.2	35.8 *

Test Name	Analytes	RSA Cterm	Grasshopper EG3-95-01C	Grasshopper EG3-95-02C
METALS	ALUMINUM	62.43	76.9	81.2
	BARIUM	1.994	3.8	5.9
	BERYLLIUM	0.002	0.01	0.01
	CADMIUM	0.5006	0.79	0.4 *
	CHROMIUM	0.3676	0.3 *	0.25 *
	COBALT	0.1143	0.13	0.14
	COPPER	21.21	31.5	26.9
	IRON	79.76	90	95.5
	LEAD	0.523	0.34 *	0.38 *
	MANGANESE	6.523	7.2	8
	MERCURY	0.	0.02	0.01
	SELENIUM	0.2014	0.17 *	0.17 *
	SILVER	0.0581	0.1	0.1
	VANADIUM	0.1233	0.13	0.14
	ZINC	57.77	60.8	52 *

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.

Table 5-32. Summary of Biota Sample Dioxin/Furans Results for the Burn Pads (SWMU 1b)

Test Name	Analytes	RSA Cterm	Gumweed EM3-94-01	Gumweed EM3-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	1.516	ND 0.11	6.0694
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.732	0.5415 *	ND 0.489
	OCTACHLORODIBENZODIOXIN	2.5	4.9776	ND 1.302
	OCTACHLORODIBENZOFURAN	1.11	1.476	2.4133
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.9946	0.7437 *	12.849
	TOTAL HEPTACHLORODIBENZOFURANS	0.909	0.7443 *	ND 0.608
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	1.066	0.3706 *	5.5498
	TOTAL HEXACHLORODIBENZOFURANS	0.3963	0.2187 *	ND 0.422
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.3008	0.1727 *	ND 0.342
	TOTAL TETRACHLORODIBENZOFURANS	1.254	0.8501 *	ND 0.277

Test Name	Analytes	RSA Cterm	Rabbitbrush EB3-94-01	Rabbitbrush EB3-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	0.898 *	ND 0.309
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	1.7606	ND 0.309
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.8575	0.1991 *	ND 0.188
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	0.5706	ND 0.059

Test Name	Analytes	RSA Cterm	Grasshopper EG3-95-01C	Grasshopper EG3-95-02C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.7685	2.7052	ND 0.308
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.349	0.0896 *	ND 0.194
	OCTACHLORODIBENZODIOXIN	1.849	7.714	1.6467 *
	OCTACHLORODIBENZOFURAN	1.518	0.4048 *	ND 0.401
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.7685	3.5081	0.3084 *
	TOTAL HEXACHLORODIBENZOFURANS	0.3216	0.0896 *	NV

Note.—All values in ng/kg (equal to ppt).

RSA=Reference Study Area.

Cterm=Concentration Term.

*=Analyte concentration is less than Cterm.

ND=Analyte not detected in sample.

NV=Not a Valid Detect.

Table 5-33. *Summary of Remaining Biota Sample Analytical Results for the Burn Pads (SWMU 1b)*

Test Name	Analytes	RSA Cterm	Gumweed EM3-94-01	Gumweed EM3-94-02
	No Detections for Gumweed in this table.			

Test Name	Analytes	RSA Cterm	Rabbitbrush EB3-94-01	Rabbitbrush EB3-94-02
PAH	CHRYSENE	0.5024	0.95	ND 0.83
	FLUORANTHENE	2.227	1.7 *	ND 1.3
	PYRENE	0.78	0.44 *	ND 0.31

Test Name	Analytes	RSA Cterm	Grasshopper EG3-95-01C	Grasshopper EG3-95-02C
	No Detections for Grasshoppers in this table.			

Note.—All values in $\mu g/kg$ (equal to ppb).
PAH=Polynuclear Aromatic Hydrocarbon.
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
ND=Analyte not detected in sample.

The two gumweed samples from SWMU 1b (EM3-94-01 and -02) contained 11 and 12 metals above detection limits, respectively. Cadmium was detected only in sample EM3-94-02 at a concentration of 4.0 ppm. The remaining 11 metals were detected in both samples as follows: aluminum (266 and 265 ppm), barium (17.3 and 16.9 ppm), cobalt (0.08 and 0.09 ppm) (both values "B" qualified), chromium (0.39 and 0.47 ppm), copper (10.3 and 5.7 ppm), iron (196 and 198 ppm), manganese (27.2 and 23.6 ppm), nickel (0.52 and 0.46 ppm) (both values "B" qualified), lead (0.60 and 1.70 ppm), vanadium (0.26 and 0.35 ppm) (both values "B" qualified), and zinc (21.7 and 54.7 ppm), respectively.

Sixteen metals were detected in the composite beetle sample from SWMUs 1b and 1c (EL3-95-01C). The metals and their reported detection values in ppm are as follows: aluminum (135.0), arsenic (0.4), barium (10.0), beryllium (0.01), cadmium (0.42), cobalt (0.16), chromium (0.51), copper (7.0), iron (150), mercury (0.02), manganese (14.4), nickel (0.87), lead (0.85), antimony (0.26), vanadium (0.19), and zinc (35.8). Two composite grasshopper samples from SWMUs 1b and 1c, EG3-95-01C and EG3-95-02C, reported detectable quantities of 15 metals: aluminum (76.9 and 81.2 ppm), barium (3.8 and 5.9 ppm), beryllium (0.01 and 0.01 ppm), cadmium (0.79 and 0.4 ppm), cobalt (0.13 and 0.14 ppm), chromium (0.3 and 0.25 ppm), copper (31.5 and 26.9 ppm), iron (90 and 95.5 ppm), mercury (0.02 and 0.01 ppm), manganese (7.2 and 8.0 ppm), lead (0.34 and 0.38 ppm), selenium (0.17 and 0.17 ppm), silver (0.1 and 0.1 ppm), vanadium (0.13 and 0.14 ppm), and zinc (60.8 and 52.0 ppm, respectively).

Dioxins/Furans

Rabbitbrush sample EB3-94-01 from SWMU 1b had detectable quantities of the following compounds: 1234678-HpCDD at 0.9 ppt; total HpCDD at 1.76 ppt; total HxCDD at 0.2 ppt; and total TCDF at 0.57 ppt.

Gumweed sample EM3-94-01 had detectable quantities of the following compounds: 1234678-HpCDF at 0.54 ppt; OCDD at 4.98 ppt; OCDF at 1.48 ppt (sample EM3-94-02 also reported this compound at 2.41 ppt); total HpCDD at 0.74 ppt (also in sample -02 at 12.85 ppt); total HpCDF at 0.74 ppt; total HxCDD at 0.37 ppt (also in sample -02 at 5.55 ppt); total HxCDF at 0.22 ppt; total TCDD at 0.17 ppt; and total TCDF at 0.85 ppt. In addition, 1234678-HpCDD was detected in sample EM3-94-02 at a level of 6.07 ppt.

SWMUs 1b and 1c grasshopper sample EG3-95-01C had the following dioxin/furan detects: 1234678-HpCDD (2.70 ppt); 123478-HxCDF (0.09 ppt); OCDD (7.71 ppt); OCDF (0.40 ppt); total HpCDD (3.51 ppt); and total HxCDF (0.09 ppt). Sample EG3-95-02C reported 1.65 ppt of OCDD and 0.31 ppt total HpCDD.

Explosives

No explosives were detected in SWMU 1b biota samples. Grasshopper/beetle samples were not analyzed for explosives.

Herbicides

No herbicides were detected in SWMU 1b biota samples. Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

No pesticides were detected in SWMU 1b biota samples.

PAHs

One rabbitbrush sample EB3-94-01 had detectable quantities of SVOCs. Values reported were 0.95 ppb for chrysene, 1.7 ppb for fluoranthene, and 0.44 ppb for pyrene. No PAHs were detected in the gumweed samples.

Grasshopper/beetle samples were not analyzed for PAHs.

5.9 SWMU 1c - TRASH BURN PITS

5.9.1 Soil Sample Results

Two surface soil samples (ES4-94-01 and ES4-94-02) were collected at SWMU 1c at approximate locations of contamination identified during the previous RFI (see Figure 5-7). These locations correspond to areas where various types of waste were burned and disposed of in pits, including reported solvent drums and waste contaminated with VOCs. Results for these samples are summarized in Table 5-34.

Inorganics

No inorganics exceeding the TEAD or RSA UBCs were present.

Dioxins/Furans

OCDD, nonspecific, was found in sample ES4-94-02 at a concentration of 0.1 ppb. The previous RFI detected OCDD and two other dioxin compounds at a depth of 5.5 feet and at concentrations ranging from 0.1 to 1.8 ppb.

Pesticides/PCBs

No pesticide or PCB compounds were detected.

Explosives

No explosive compounds were detected. Explosives were detected in the area of ES4-94-02

Table 5-34. Summary of Soil Sample Analytical Results for the Trash Burn Pits (SWMU 1c)

Test Name	Analytes	TEAD UBC	RSA UBC	ES4-94-01	ES4-94-01(D)	ES4-94-02
DIOXINS	OCTACHLORODIBENZODIOXIN	N/A	N/A	LT 0.0000234	LT 0.0000244	0.0001
METALS	ALUMINUM	28,083.	17,300.	11000*˜	12200*˜	11800*˜
	ARSENIC	14.5	8.86	4.5*˜	4.72*˜	5.17*˜
	BARIUM	247.1	134.	130*˜	134*	133*˜
	BERYLLIUM	1.455	0.82	0.596*˜	0.632*˜	0.666*˜
	CALCIUM	114,483.	35,548.	43200*	43500*	28500*˜
	CHROMIUM	20.62	22.6	14.1*˜	15.5*˜	15*˜
	COBALT	6.94	7.99	4.38*˜	4.69*˜	5.11*˜
	COPPER	24.72	17.24	11.8*˜	12.2*˜	12.3*˜
	IRON	22,731.	17,400.	13400*˜	13900*˜	14700*˜
	LEAD	32.49	73.3	11*˜	13.8*˜	17.3*˜
	MAGNESIUM	13,114.	6,311.	6890*	7040*	6760*
	MANGANESE	698.3	499.	248*˜	247*˜	276*˜
	NICKEL	17.4	14.8	8.73*˜	10.2*˜	10.2*˜
	POTASSIUM	5,449.	3,259.	3530*	3900*	3620*
	SODIUM	632.	282.	211*˜	224*˜	253*˜
	VANADIUM	28.39	24.3	20.5*˜	22.6*˜	22.3*˜
	ZINC	102.8	127.	37.4*˜	38.9*˜	46*˜

Note.—All values in $\mu g/g$ (equal to ppm).

N/A=Not Applicable.

LT=Analyte concentration is less than Certified Reporting Limit.

*=Analyte concentration is less than TEAD UBC.

˜=Analyte concentration is less than RSA UBC.

(D)=Duplicate analysis.

during the previous RFI in a test pit at a depth of 4.5 feet. The corresponding surface soil samples from the previous RFI contained no explosive compounds.

SVOCs

No SVOCs were detected. Corresponding surface soil samples from the previous RFI also contained no detectable SVOCs. However, three SVOCs (bis(2-ethylhexyl)phthalate, naphthalene, and pyrene) were detected in low concentrations at a depth of 3.5 feet in the area of ES4-94-01 during the previous RFI.

5.9.2 Biota Sample Results

Two gumweed samples (EM4-94-01 and -02) and two rabbitbrush samples (EB4-94-01 and -02) were collected at SWMU 1c. No jackrabbits were collected at this SWMU. Three *composite* grasshopper samples (EG3-95-01C through EG3-95-03C) and one *composite* beetle sample (EL3-95-01) were collected at SWMUs 1b and 1c. Tables 5-35 through 5-37 contain summaries of analyte concentrations for SWMU 1c biota.

Inorganics

The gumweed samples (EM4-94-01 and duplicate and -02) contained 10, 13, and 11 metals above detection limits, respectively. Sample EM4-94-01 duplicate contained cadmium (0.65 ppm), beryllium (0.015 ppm ("B")), and selenium (0.61 ppm), which were not detected in the original sample. Cobalt was detected in sample EM4-94-02 at 0.08 ppm but not in sample -01 and its duplicate. Aluminum (123.6 to 162 ppm), arsenic (0.81 ("B") to 1.1 ppm), barium (12.2 to 15.6 ppm), chromium (0.28 to 0.38 ppm), copper (4.2 to 6.7 ppm), iron (118.9 to 161 ppm), manganese (17.3 to 22.5), nickel (0.54 to 0.78 ppm) (all values "B" qualified), lead (0.40 to 0.86 ppm), and zinc (26.1 to 27.8 ppm) were detected in all three samples.

The rabbitbrush samples (EB4-94-01, -02, and -02 duplicate) each contained a minimum of 12 metals above detection limits. Vanadium (0.09 ppm ("B")) was detected in EB4-94-01 but not -02 and its duplicate. Conversely, cobalt was detected in EB4-94-02 and its duplicate but not sample -01. Beryllium was detected only in EB4-94-02 duplicate. The remaining 11 metals were detected in all 3 samples in the following ranges: aluminum (35.8 to 86.3 ppm), arsenic (0.24 to 0.43 ppm) (all values "B" qualified), barium (3.16 ("B") to 6.8 ppm), cadmium (0.14 ("B") to 1.4 ppm), chromium (0.21 to 0.25 ppm), copper (2.6 to 4.8 ppm), iron (45.9 to 108 ppm), manganese (9.5 to 60 ppm), nickel (0.47 ("B") to 1.8 ppm), lead (0.35 to 0.56 ppm), and zinc (6.6 to 20.8 ppm).

Refer to Section 5.8.2, SWMU 1b Biota Sample Results, for grasshopper and beetle analysis discussion.

Table 5-35. *Summary of Biota Sample Metal Results for the Trash Burn Pits (SWMU 1c)*

Test Name	Analytes	RSA Cterm	Gumweed EM4-94-01	Gumweed EM4-94-01 DUP	Gumweed EM4-94-02
METALS	ALUMINUM	199.3	124 *	123.5947 *	162 *
	ARSENIC	0.315	1.1	1.0743	0.81
	BARIUM	19.2	12.2 *	12.1984 *	15.6 *
	BERYLLIUM	0.0123	NV	0.0153	NV
	CADMIUM	0.5765	ND 0.41	0.6515	ND 0.4059
	CHROMIUM	0.4501	0.28 *	0.3073 *	0.38 *
	COBALT	0.0879	ND 0.07779	ND 0.07779	0.08 *
	COPPER	9.705	4.3 *	4.2438 *	6.7 *
	IRON	176.2	120 *	118.8567 *	161 *
	LEAD	1.428	0.75 *	0.4 *	0.86 *
	MANGANESE	39.97	17.4 *	17.3163 *	22.5 *
	NICKEL	2.293	0.78 *	0.7335 *	0.54 *
	SELENIUM	0.4039	ND 0.57	0.6059	ND 0.5644
	ZINC	21.31	26.3	26.0819	27.8

Test Name	Analytes	RSA Cterm	Rabbitbrush EB4-94-01	Rabbitbrush EB4-94-02	Rabbitbrush EB4-94-02 DUP
METALS	ALUMINUM	106.6	35.8 *	86.3 *	84.0805 *
	ARSENIC	0.241	0.24 *	0.43	0.3327
	BARIUM	4.672	6.8	3.2 *	3.1592 *
	BERYLLIUM	0.003	NV	NV	0.0106
	CADMIUM	0.3042	0.14 *	1.4	0.8557
	CHROMIUM	0.2775	0.23 *	0.21 *	0.2536 *
	COBALT	0.048	ND 0.09429	0.11	0.1197
	COPPER	4.815	4.8 *	2.6 *	2.6259 *
	IRON	103.5	45.9 *	108	105.6503
	LEAD	1.631	0.35 *	0.52 *	0.5567 *
	MANGANESE	33.68	9.5 *	60	59.9299
	NICKEL	0.6769	0.47 *	1.8	1.6188
	VANADIUM	0.126	0.09 *	ND 0.0795	ND 0.0795
	ZINC	12.19	6.6 *	20.8	20.8276

Table 5-35. Summary of Biota Sample Metal Results for the Trash Burn Pits (SWMU 1c) (continued)

Test Name	Analytes	RSA Cterm	Beetle EL3-95-01C
METALS	ALUMINUM	194.	135 *
	ANTIMONY	0.21	0.26
	ARSENIC	0.48	0.4 *
	BARIUM	2.6	10
	BERYLLIUM	0.01	0.01
	CADMIUM	0.15	0.42
	CHROMIUM	0.43	0.51
	COBALT	0.15	0.16
	COPPER	5.7	7
	IRON	213.	150 *
	LEAD	0.48	0.85
	MANGANESE	10.4	14.4
	MERCURY	0.01	0.02
	NICKEL	1.	0.87 *
	VANADIUM	0.31	0.19 *
	ZINC	43.2	35.8 *

Test Name	Analytes	RSA Cterm	Grasshopper EG3-95-01C	Grasshopper EG3-95-02C
METALS	ALUMINUM	62.43	76.9	81.2
	BARIUM	1.994	3.8	5.9
	BERYLLIUM	0.002	0.01	0.01
	CADMIUM	0.5006	0.79	0.4 *
	CHROMIUM	0.3676	0.3 *	0.25 *
	COBALT	0.1143	0.13	0.14
	COPPER	21.21	31.5	26.9
	IRON	79.76	90	95.5
	LEAD	0.523	0.34 *	0.38 *
	MANGANESE	6.523	7.2	8
	MERCURY	0.	0.02	0.01
	SELENIUM	0.2014	0.17 *	0.17 *
	SILVER	0.0581	0.1	0.1
	VANADIUM	0.1233	0.13	0.14
	ZINC	57.77	60.8	52 *

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
NV=Not a Valid Detect.
ND=Analyte not detected in sample.
DU=Duplicate analysis.

Table 5-36. Summary of Biota Sample Dioxin/Furans Results for the Trash Burn Pits (SWMU 1c)

Test Name	Analytes	RSA Cterm	Gumweed EM4-94-01	Gumweed EM4-94-01 DUP	Gumweed EM4-94-02
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.732	NV	ND 0.613	10.029
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.63	ND 0.41	ND 0.542	2.034
	OCTACHLORODIBENZODIOXIN	2.5	ND 1.634	ND 1.588	4.1056
	OCTACHLORODIBENZOFURAN	1.11	ND 1.383	ND 1.344	18.7237
	TOTAL HEPTACHLORODIBENZOFURANS	0.909	ND 0.649	ND 0.762	10.029
	TOTAL HEXACHLORODIBENZOFURANS	0.3963	0.5595	ND 0.513	3.6549
	TOTAL PENTACHLORODIBENZOFURANS	0.4507	ND 0.27	ND 0.326	1.4945

Test Name	Analytes	RSA Cterm	Rabbitbrush EB4-94-01	Rabbitbrush EB4-94-02	Rabbitbrush EB4-94-02 DUP
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	0.1606 *	ND 0.178	ND 0.103
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	0.1606 *	ND 0.221	ND 0.128
	TOTAL HEXACHLORODIBENZOFURANS	1.145	0.3244 *	ND 0.126	ND 0.08
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	0.2263 *	ND 0.082	ND 0.059
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.203	0.1541 *	ND 0.085	ND 0.062
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	1.1155	ND 0.07099	ND 0.055

Test Name	Analytes	RSA Cterm	Grasshopper EG3-95-01C	Grasshopper EG3-95-02C
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.7685	2.7052	ND 0.308
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.349	0.0896 *	ND 0.194
	OCTACHLORODIBENZODIOXIN	1.849	7.714	1.6467 *
	OCTACHLORODIBENZOFURAN	1.518	0.4048 *	ND 0.401
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.7685	3.5081	0.3084 *
	TOTAL HEXACHLORODIBENZOFURANS	0.3216	0.0896 *	NV

Note.—All values in ng/kg (equal to ppt).
RSA=Reference Study Area.
Cterm=Concentration Term.
NV=Not a Valid Detect.
ND=Analyte not detected in sample.
DUP=Duplicate analysis.
*=Analyte concentration is less than Cterm.

Table 5-37. *Summary of Remaining Biota Sample Analytical Results for the Trash Burn Pits (SWMU 1c)*

Test Name	Analytes	RSA Cterm	Gumweed EM4-94-01	Gumweed EM4-94-01 DUP	Gumweed EM4-94-02
PAH	PHENANTHRENE	9.39	ND 3.39	ND 3.4	5.8 *

Test Name	Analytes	RSA Cterm	Rabbitbrush EB4-94-01	Rabbitbrush EB4-94-02	Rabbitbrush EB4-94-02 DUP
PAH	CHRYSENE	0.5024	1.1	ND 0.83	0.93999
	FLUORANTHENE	2.227	1.4 *	2 *	2.1 *
	PHENANTHRENE	7.8	5.2 *	7.2 *	9.4
	PYRENE	0.78	ND 0.31	3.2	1.1
PESTICIDES	DDE	61.56	ND 34	83	84

Test Name	Analytes	RSA Cterm	Grasshopper EG3-95-01C	Grasshopper EG3-95-02C

No Detections for Grasshoppers in this table.

Note.—All values in μg/kg (equal to ppb).
PAH = Polynuclear Aromatic Hydrocarbon.
RSA = Reference Study Area.
Cterm = Concentration Term.
ND = Analyte not detected in sample.
DUP = Duplicate analysis.
* = Analyte concentration is less than Cterm.

Dioxins/Furans

Rabbitbrush sample EB4-94-01 from SWMU 1c had the following dioxin/furan detects: 1234678-HpCDF at 0.16 ppt; total HpCDF at 0.16 ppt; total HxCDF at 0.32 ppt; total PeCDF at 0.23 ppt; total TCDD at 0.15 ppt; and total TCDF at 1.12 ppt.

Gumweed sample EM4-94-02 had the following detects: 1234678-HpCDF at 10.03 ppt; 123478-HxCDF at 2.03 ppt; OCDD at 4.11 ppt; OCDF at 18.72 ppt; total HpCDF at 10.03 ppt; total HxCDF at 3.65 ppt (also in sample EM4-94-01 at 0.56 ppt); and total PeCDF at 1.49 ppt.

Refer to Section 5.8.2, SWMU 1b Biota Samples Results, for discussions of grasshopper and beetle analyses.

Explosives

No explosives were detected in SWMU 1c biota samples. Grasshopper/beetle samples were not analyzed for explosives.

Herbicides

No herbicides were detected in SWMU 1c biota samples. Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

The pesticide 4,4'-DDE was reported in the analyses for rabbitbrush sample EB4-94-02 (83 ppb) and its duplicate (84 ppb).

PAHs

Each of the two rabbitbrush samples and the duplicate of sample EB4-94-02 had low quantities of fluoranthene (from 1.4 to 2.1 ppb) and phenanthrene (from 5.2 to 9.4 ppb). In addition, chrysene was reported in sample EB4-94-01 (1.1 ppb) and sample EB4-94-02dup (0.94 ppb). Pyrene was detected in sample EB4-94-02 (3.2 ppb) and its duplicate (1.1 ppb). Of the two gumweed samples (plus a duplicate), only phenanthrene was detected in sample EM4-94-02 at a level of 5.8 ppb.

Grasshopper/beetle samples were not analyzed for PAHs.

5.10 REFERENCE STUDY AREA

5.10.1 Soil Sample Results

A total of 16 surface soil samples (ESB-94-01 through -07, ESB-94-10 through -15, and ESB-

94-17 through -19) were collected at the RSA at selected random locations associated with available vegetation (Figures 5-8 and 5-9). A single field duplicate of sample ESB-94-06 was also collected. Results of these samples are summarized in Table 5-38.

Inorganics

See Section 5.12 for a summary of the inorganics detected and the corresponding statistical analyses performed to allow comparison of the RSA data set with the TEAD background data set, and with data from selected SWMUs at TEAD.

Dioxins/Furans

OCDD, nonspecific, was detected in one sample (ESB-94-05) at a concentration of 1.26 ppb but was found to be associated with method blank contamination in the laboratory.

Pesticides/PCBs

Aldrin and beta-endosulfan were reported in samples ESB-94-01, -02, -03, -04, -05, -06 duplicate, and -07, but all values were flagged with a "U" flag code, indicating they were unconfirmed detections. Sample ESB-94-10 contained a confirmed detection of beta-endosulfan at a concentration of 0.92 ppb (0.000917 μg/g). ESB-94-03 contained dieldrin at a concentration of 3.8 ppb (0.0038 μg/g). ESB-94-04 contained an unconfirmed detection of endrin aldehyde, and ESB-95-05 had an unconfirmed detection of endrin ketone. Unconfirmed detections of endosulfan sulfate were reported in ESB-94-03, -05, -06 and its duplicate, and -07. ESB-94-05 and -07 contained confirmed detections of p,p-DDT at concentrations of 6.64 and 6.67 ppb, respectively.

Explosives

No explosive compounds were detected.

SVOCs

Several SVOCs were detected in low concentrations in surface soil samples from the RSA. Sample ESB-94-07 contained detections of 2-methylnaphthalene (0.058 μg/g), fluoranthene (0.057 μg/g), phenanthrene (0.12 μg/g), pyrene (0.2 μg/g), and diethyl phthalate (0.4 μg/g). Sample ESB-94-06 contained detections of pyrene (0.23 μg/g) and diethyl phthalate (5.8 μg/g). Other samples contained single detections of SVOCs, including benzo(g,h,i)perylene at 0.35 μg/g in ESB-94-03, di-n-butyl phthalate at 1.6 μg/g in ESB-94-13, and diethyl phthalate at 1.7 μg/g in ESB-94-04. It is suspected that the phthalates are a result of laboratory contamination.

Table 5-38. Summary of Soil Sample Analytical Results for the Reference Study Area (RSA)

Test Name	Analytes	TEAD UBC	RSA UBC	ESB-94-01	ESB-94-02	ESB-94-03	ESB-94-04	ESB-94-05	ESB-94-06
DIOXINS	OCTACHLORODIBENZODIOXIN	N/A	N/A	LT 0.0000128	LT 0.0000337	LT 0.0000404	LT 0.0000235	0.00126	LT 0.000232
METALS	ALUMINUM	28,083.	17,300.	2260*-	13000*-	8440*-	2190*-	1180*-	1180*-
	ARSENIC	14.5	8.86	15.1	4.96*-	3.99*-	6.21*-	11.4*	4.77*-
	BARIUM	247.1	134.	21.9*-	134*	94.3*-	23.5*-	15.2*-	11.1*-
	BERYLLIUM	1.455	0.82	0.667*-	0.749*-	0.486*-	0.774*-	LT 0.427	LT 0.427
	CALCIUM	114,483.	35,548.	21300*-	39900*	22400*-	13100*-	12800*-	15300*-
	CHROMIUM	20.62	22.6	3.16*-	14.9*-	10.5*-	2.89*-	2.81*-	2.09*-
	COBALT	6.94	7.99	6.8*-	6.7*-	4.78*-	6.85*-	4.46*-	3.64*-
	COPPER	24.72	17.24	16*-	14.4*-	15.7*-	17.5*	5.76*-	3.59*-
	IRON	22,731.	17,400.	3300*-	15600*-	11600*-	3020*-	2470*-	2150*-
	LEAD	32.49	73.3	18*-	14.5*-	17*-	15.4*-	20.5*-	10*-
	MAGNESIUM	13,114.	6,311.	1300*-	7140*	5010*-	1320*-	1030*-	1040*-
	MANGANESE	698.3	499.	69*-	499*	381*-	77.3*-	49.2*-	38.4*-
	MERCURY	0.0572	0.07	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	0.0697-
	NICKEL	17.4	14.8	5.15*-	12.9*-	9.2*-	3.37*-	3.42*-	3.91*-
	POTASSIUM	5,449.	3,259.	735*-	4830*	3190*-	709*-	333*-	302*-
	SODIUM	632.	282.	203*-	286*	167*-	158*-	119*-	95.3*-
	VANADIUM	28.39	24.3	3.77*-	17.8*-	12.9*-	3.26*-	3.02*-	2.32*-
	ZINC	102.8	127.	12.5*-	53.6*-	42.4*-	11.3*-	10.7*-	10.3*-
SEMIVOLATILES	2-METHYLNAPHTHALENE	N/A	N/A	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	BENZO [G,H,I] PERYLENE	N/A	N/A	LT 0.18	LT 0.18	0.35	LT 0.18	LT 0.18	LT 0.18
	DI-N-BUTYL PHTHALATE	N/A	N/A	LT 1.3	LT 1.3	LT 1.3	LT 1.3	LT 1.3	LT 1.3
	DIETHYL PHTHALATE	N/A	N/A	LT 0.24	LT 0.24	LT 0.24	1.7	LT 0.24	5.8
	FLUORANTHENE	N/A	N/A	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	PHENANTHRENE	N/A	N/A	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	PYRENE	N/A	N/A	LT 0.083	LT 0.083	LT 0.083	LT 0.083	LT 0.083	0.23
PESTICIDES/PCBS	ALDRIN	N/A	N/A	0.00413	0.00547	0.00361	0.00515	0.0103	LT 0.0014
	BETA-ENDOSULFAN	N/A	N/A	LT 0.0007	0.00105	0.00581	0.00124	0.00149	0.00163
	DDT	N/A	N/A	LT 0.0035	LT 0.0035	LT 0.0035	LT 0.0035	0.00664	LT 0.0035
	DIELDRIN	N/A	N/A	LT 0.0016	LT 0.0016	0.0038	LT 0.0016	LT 0.0016	LT 0.0016
	ENDOSULFAN SULFATE	N/A	N/A	ND 0.0005	ND 0.0005	0.00143	ND 0.0005	0.00117	0.00092
	ENDRIN ALDEHYDE	N/A	N/A	ND 0.0005	ND 0.0005	ND 0.0005	0.00193	ND 0.0005	ND 0.0005
	ENDRIN KETONE	N/A	N/A	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005	0.000811	ND 0.0005

Table 5-38. *Summary of Soil Sample Analytical Results for the Reference Study Area (RSA) (continued)*

Test Name	Analytes	TEAD UBC	RSA UBC	ESB-94-14	ESB-94-15	ESB-94-17	ESB-94-18	ESB-94-19
DIOXINS	OCTACHLORODIBENZODIOXIN	N/A	N/A	LT 0.0000235	LT 0.0000188	LT 0.0000283	LT 0.000019	LT 0.0000094
METALS	ALUMINUM	28,083.	17,300.	2200*⁻	2290*⁻	17300*	15200*⁻	16100*⁻
	ARSENIC	14.5	8.86	7.29*⁻	6.23*⁻	8.97*	8.98*	7.43*⁻
	BARIUM	247.1	134.	21.7*⁻	22.9*⁻	134*	127*⁻	130*⁻
	BERYLLIUM	1.455	0.82	LT 0.427	0.553*⁻	0.823*	0.803*⁻	0.78*⁻
	CALCIUM	114,483.	35,548.	22300*⁻	23400*⁻	44100*	43500*	45500*
	CHROMIUM	20.62	22.6	3.39*⁻	3.43*⁻	22.6	19.4*⁻	22.3⁻
	COBALT	6.94	7.99	4.11*⁻	4.43*⁻	7.74⁻	6.53*⁻	6.47*⁻
	COPPER	24.72	17.24	8.74*⁻	11.1*⁻	17.7*	16*⁻	15.7*⁻
	IRON	22,731.	17,400.	2180*⁻	2490*⁻	17400*	16500*⁻	16300*⁻
	LEAD	32.49	73.3	12.9*⁻	16*⁻	24.2*⁻	22.2*⁻	21.4*⁻
	MAGNESIUM	13,114.	6,311.	2110*⁻	2390*⁻	9960*	9530*	9160*
	MANGANESE	698.3	499.	38*⁻	42.8*⁻	307*⁻	308*⁻	357*⁻
	MERCURY	0.0572	0.07	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05
	NICKEL	17.4	14.8	8.48*⁻	2.96*⁻	13.1*⁻	14.2*⁻	14.8*
	POTASSIUM	5,449.	3,259.	783*⁻	843*⁻	6090	5430*	5860
	SODIUM	632.	282.	174*⁻	164*⁻	370*	411*	594*
	VANADIUM	28.39	24.3	3.17*⁻	3.16*⁻	24.3*	21.3*⁻	22.7*⁻
	ZINC	102.8	127.	8.6*⁻	10.6*⁻	61.9*⁻	59.2*⁻	58.6*⁻
SEMIVOLATILES	2-METHYLNAPHTHALENE	N/A	N/A	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	BENZO [G,H,I] PERYLENE	N/A	N/A	LT 0.18	LT 0.18	LT 0.18	LT 0.18	LT 0.18
	DI-N-BUTYL PHTHALATE	N/A	N/A	LT 1.3	LT 1.3	LT 1.3	LT 1.3	LT 1.3
	DIETHYL PHTHALATE	N/A	N/A	LT 0.24	LT 0.24	LT 0.24	LT 0.24	LT 0.24
	FLUORANTHENE	N/A	N/A	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	PHENANTHRENE	N/A	N/A	LT 0.032	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	PYRENE	N/A	N/A	LT 0.083	LT 0.083	LT 0.083	LT 0.083	LT 0.083
PESTICIDES/PCBS	ALDRIN	N/A	N/A	LT 0.0014	LT 0.0014	LT 0.0014	LT 0.0014	LT 0.0014
	BETA-ENDOSULFAN	N/A	N/A	LT 0.0007	LT 0.0007	LT 0.0007	LT 0.0007	LT 0.0007
	DDT	N/A	N/A	LT 0.0035	LT 0.0035	LT 0.0035	LT 0.0035	LT 0.0035
	DIELDRIN	N/A	N/A	LT 0.0016	LT 0.0016	LT 0.0016	LT 0.0016	LT 0.0016
	ENDOSULFAN SULFATE	N/A	N/A	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005
	ENDRIN ALDEHYDE	N/A	N/A	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005
	ENDRIN KETONE	N/A	N/A	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005

Note.—All values in μg/g (equal to ppm).
N/A=Not Applicable.
LT=Analyte concentration is less than Certified Reporting Limit.
*=Analyte concentration is less than TEAD UBC.
⁻=Analyte concentration is less than RSA UBC.
ND=Analyte not detected in sample.
(D)=Duplicate analysis.

Table 5-38. *Summary of Soil Sample Analytical Results for the Reference Study Area (RSA) (continued)*

Test Name	Analytes	TEAD UBC	RSA UBC	ESB-94-06(D)	ESB-94-07	ESB-94-10	ESB-94-11	ESB-94-12	ESB-94-13
DIOXINS	OCTACHLORODIBENZODIOXIN	N/A	N/A	LT 0.000298	LT 0.00214	LT 0.000065	LT 0.0000776	LT 0.0000533	LT 0.00002
METALS	ALUMINUM	28,083.	17,300.	1180*-	5900*-	9000*-	2330*-	2330*-	2460*-
	ARSENIC	14.5	8.86	5.11*-	6.53*-	5.92*-	6.16*-	4.33*-	7.85*-
	BARIUM	247.1	134.	11.2*-	84.8*-	67.1*-	17.1*-	21.5*-	22.4*-
	BERYLLIUM	1.455	0.82	LT 0.427	LT 0.427	LT 0.427	0.564*-	0.517*-	0.614*-
	CALCIUM	114,483.	35,548.	17500*-	33300*-	42100*	24800*-	22200*-	17500*-
	CHROMIUM	20.62	22.6	2.45*-	13.9*-	12.7*-	3.45*-	3.57*-	3.64*-
	COBALT	6.94	7.99	4.26*-	4.79*-	3.23*-	4.85*-	4.06*-	4.52*-
	COPPER	24.72	17.24	15.7*-	39	9.06*-	10.7*-	8.74*-	11.6*-
	IRON	22,731.	17,400.	2090*-	13500*-	11600*-	2920*-	2230*-	2560*-
	LEAD	32.49	73.3	10.7*-	73.3	14*-	LT 7.44	10.4*-	20.8*-
	MAGNESIUM	13,114.	6,311.	1070*-	4840*-	4840*-	2230*-	2420*-	2230*-
	MANGANESE	698.3	499.	43.4*-	236*-	226*-	54.1*-	44.5*-	39.9*-
	MERCURY	0.0572	0.07	LT 0.05	0.0622-	LT 0.05	LT 0.05	LT 0.05	LT 0.05
	NICKEL	17.4	14.8	3.3*-	13.6*-	12.3*-	3.38*-	3.07*-	2.85*-
	POTASSIUM	5,449.	3,259.	281*-	1110*-	1800*-	577*-	758*-	878*-
	SODIUM	632.	282.	83.5*-	131*-	123*-	168*-	74.3*-	344*
	VANADIUM	28.39	24.3	2.37*-	14*-	14.9*-	3.99*-	3.43*-	3.34*-
	ZINC	102.8	127.	8.92*-	127	42*-	11*-	8.32*-	10.2*-
SEMIVOLATILES	2-METHYLNAPHTHALENE	N/A	N/A	LT 0.032	0.058	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	BENZO [G,H,I] PERYLENE	N/A	N/A	LT 0.18	LT 0.18	LT 0.18	LT 0.18	LT 0.18	LT 0.18
	DI-N-BUTYL PHTHALATE	N/A	N/A	LT 1.3	LT 1.3	LT 1.3	LT 1.3	LT 1.3	1.6
	DIETHYL PHTHALATE	N/A	N/A	LT 0.24	0.4	LT 0.24	LT 0.24	LT 0.24	LT 0.24
	FLUORANTHENE	N/A	N/A	LT 0.032	0.057	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	PHENANTHRENE	N/A	N/A	LT 0.032	0.12	LT 0.032	LT 0.032	LT 0.032	LT 0.032
	PYRENE	N/A	N/A	LT 0.083	0.2	LT 0.083	LT 0.083	LT 0.083	LT 0.083
PESTICIDES/PCBS	ALDRIN	N/A	N/A	0.00442	0.00565	LT 0.0014	LT 0.0014	LT 0.0014	LT 0.0014
	BETA-ENDOSULFAN	N/A	N/A	0.00173	0.00124	0.000917	LT 0.0007	LT 0.0007	LT 0.0007
	DDT	N/A	N/A	LT 0.0035	0.00667	LT 0.0035	LT 0.0035	LT 0.0035	LT 0.0035
	DIELDRIN	N/A	N/A	LT 0.0016	LT 0.0016	LT 0.0016	LT 0.0016	LT 0.0016	LT 0.0016
	ENDOSULFAN SULFATE	N/A	N/A	0.000954	0.000834	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005
	ENDRIN ALDEHYDE	N/A	N/A	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005
	ENDRIN KETONE	N/A	N/A	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005	ND 0.0005

5.10.2 Biota Sample Results

A total of 16 sweetclover samples (ECB-94-04 through -15, a duplicate for ECB-94-08, and ECB-94-17 through -19), 7 gumweed samples (EMB-94-01, -05, -06, -11, -12, -15, and -18), 15 rabbitbrush samples (EBB-94-01 through -15), and 15 kochia samples (EKB-94-02, -03, -05, -06, -10, -12 through -15, and -17 through -22) were collected at the RSA. Fifteen jackrabbits were also collected (EJB-94-01 through -15). None of the kochia samples were chemically analyzed due to a lack of TEAD sample material for comparison. Ten *composite* grasshopper samples (EGB-95-01C through -10C) and three *composite* beetle samples (ELB-95-01C through -03C) were collected at the RSA. See Tables 5-39 through 5-41 for analyte concentrations in RSA biota.

Inorganics

Sweetclover samples at the RSA contained aluminum in 15 of 16 samples analyzed in concentrations ranging from 11.8 to 65 ppm. Arsenic was detected in 4 of the 16 samples in concentrations ranging from 0.33 to 0.49 ppm (all values "B" qualified). Barium was detected in all 16 samples, ranging from 7.10 to 27.0 ppm. Beryllium was detected in one sample (ECB-94-08 duplicate) at a value of 0.009 ppm ("B"). Cadmium was detected in only one sample (ECB-94-05) at 0.16 ppm. Cobalt was detected in 7 of the 16 samples at a range of 0.07 to 0.20 ppm (all values "B" qualified). Chromium was detected in all 16 samples at concentrations ranging from 0.16 ("B") to 0.36 ppm. Copper was detected in all 16 samples, ranging from 2.0 to 13.8 ppm. Iron was also detected in all 16 samples, ranging from 11.3 to 84.5 ppm. Manganese was detected in all 16 samples, ranging from 4.1 to 16.6 ppm. Nickel was also present in all 16 samples at concentrations of 0.26 to 1.30 ppm. Lead, in all 16 samples, ranged from 0.29 ("B") to 0.67 ppm. Zinc, also detected in all samples, ranged from 2.0 to 18.8 ppm. Mercury was detected in 12 samples, ranging from 0.01 to 0.02 ppm.

Gumweed samples EMB-94-01, -05, -06, -11, -12, -15, and -18 contained up to 13 metals above detection limits. Aluminum was detected in five of the seven samples in concentrations ranging from 93.6 to 301 ppm. Barium was detected in all seven samples from 4.1 to 23.1 ppm. Beryllium, in three samples, ranged from 0.01 to 0.02 ppm all with "B" qualifiers. Cadmium was detected in three of the seven samples, ranging from 0.42 ("B") to 0.94 ppm. Cobalt was also present in three samples from 0.08 to 0.12 ppm (all values "B" qualified). Chromium, in all seven samples, ranged from 0.22 to 0.65 ppm. Copper (4.8 to 13.5), iron (65.8 to 281 ppm), manganese (6.5 to 63.4 ppm), nickel (0.32 ("B") to 4.7 ppm), and lead (0.54 to 1.50 ppm) were also detected in all seven samples. Selenium at 0.57 ppm was detected only in sample EMB-94-15. Vanadium was detected in four samples, ranging from 0.13 to 0.38 ppm (all values "B" qualified). Zinc was present in all seven samples, ranging from 10.5 to 24.3 ppm.

The 15 rabbitbrush samples from the RSA contained up to 13 metals above detection limits. Aluminum was detected in all 15 samples at concentrations ranging from 40.8 to 210 ppm ("B"). Arsenic was detected in 7 of 15 samples, ranging from 0.26 to 0.33 ppm (all values "B" qualified). Barium (1.9 ("B") to 7.2 ppm) was detected in all 15 samples. Cadmium (0.16

Table 5-39. *Summary of Biota Sample Metal Results for the Reference Study Area (RSA)*

Test Name	Analytes	RSA Cterm	Gumweed EMB-94-01	Gumweed EMB-94-05	Gumweed EMB-94-06	Gumweed EMB-94-11	Gumweed EMB-94-12	Gumweed EMB-94-15	Gumweed EMB-94-18
METALS	ALUMINUM	199.3	125 *	93.6 *	301	103 *	ND 80.5	ND 80.5	207
	BARIUM	19.2	23.1	16.6 *	21.6	12.8 *	4.1 *	10.4 *	11.7 *
	BERYLLIUM	0.0123	NV	NV	NV	NV	0.01 *	0.01 *	0.02
	CADMIUM	0.5765	ND 0.41	0.46 *	0.93999	0.42 *	ND 0.404	ND 0.404	ND 0.408
	CHROMIUM	0.4501	0.37 *	0.29 *	0.65	0.27 *	0.22 *	0.23 *	0.36 *
	COBALT	0.0879	0.09	ND 0.0775	0.12	ND 0.0775	ND 0.0766	ND 0.0766	0.08 *
	COPPER	9.705	13.5	5.8 *	10.6	5.3 *	5 *	4.8 *	5.2 *
	IRON	176.2	113 *	88.1 *	281	92.2 *	65.8 *	74.6 *	137 *
	LEAD	1.428	1.5	1.5	1.5	1.3 *	0.54 *	0.59 *	0.76 *
	MANGANESE	39.97	20.6 *	30.2 *	63.4	26.9 *	6.5 *	13.7 *	25.2 *
	NICKEL	2.293	4.7	0.32 *	0.78 *	0.37 *	0.48 *	0.45 *	0.8 *
	SELENIUM	0.4039	ND 0.57	ND 0.57	ND 0.57	ND 0.57	ND 0.5574	0.57	ND 0.56299
	VANADIUM	0.2452	0.19 *	0.13 *	0.38	ND 0.1074	ND 0.107	ND 0.107	0.23 *
	ZINC	21.31	10.5 *	21.9	24.3	12.2 *	21.2 *	14.5 *	17.6 *

Test Name	Analytes	RSA Cterm	Rabbitbrush EBB-94-01	Rabbitbrush EBB-94-02	Rabbitbrush EBB-94-03	Rabbitbrush EBB-94-04	Rabbitbrush EBB-94-05	Rabbitbrush EBB-94-06	Rabbitbrush EBB-94-07
METALS	ALUMINUM	106.6	82.4 *	46.9 *	40.8 *	210	61.8 *	76.6 *	112
	ARSENIC	0.241	0.26	ND 0.2574	ND 0.2453	ND 0.2407	ND 0.2476	0.29	0.26
	BARIUM	4.672	5.5	5.4	7.2	6.8	5.3	3.1 *	4.1 *
	CADMIUM	0.3042	0.23 *	0.59	0.23 *	0.2 *	0.25 *	0.17 *	0.23 *
	CHROMIUM	0.2775	0.2 *	0.21 *	0.24 *	0.35	0.22 *	0.25 *	0.31
	COPPER	4.815	6.4	3.8 *	4.9	4.9	3 *	4 *	4.9
	IRON	103.5	82 *	49.1 *	47.5 *	186	64.8 *	82.1 *	112
	LEAD	1.631	2.3	0.71 *	0.92 *	1.3 *	0.9 *	0.39 *	2.2
	MANGANESE	33.68	14.9 *	27 *	31.6 *	47.1	43.7	43.6	43.9
	MERCURY	0.0134	0.03	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *
	NICKEL	0.6769	0.52 *	0.3 *	0.54 *	0.81	0.51 *	0.49 *	0.95
	VANADIUM	0.126	0.08 *	ND 0.0792	ND 0.0789	0.27	ND 0.0791	0.1 *	0.14
	ZINC	12.19	11 *	8.2 *	10.3 *	11.5 *	11.2 *	11.8 *	12.1 *

Table 5-39. Summary of Biota Sample Metal Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Rabbitbrush EBB-94-08	Rabbitbrush EBB-94-09	Rabbitbrush EBB-94-10	Rabbitbrush EBB-94-11	Rabbitbrush EBB-94-12	Rabbitbrush EBB-94-13	Rabbitbrush EBB-94-14
METALS	ALUMINUM	106.6	45.7 *	66.2 *	109	73.2 *	92 *	88.5 *	75 *
	ARSENIC	0.241	ND 0.2476	ND 0.243	ND 0.2453	ND 0.243	0.28	0.32	0.33
	BARIUM	4.672	3.1 *	3.2 *	3.4 *	2.4 *	2 *	1.9 *	2.3 *
	CADMIUM	0.3042	0.23 *	0.34	0.29 *	0.22 *	0.16 *	0.24 *	0.26 *
	CHROMIUM	0.2775	0.16 *	0.23 *	0.31	0.35	0.23 *	0.2 *	0.2 *
	COPPER	4.815	3.9 *	4.2 *	3.3 *	2.5 *	3.4 *	5.5	5.7
	IRON	103.5	51.6 *	61.8 *	103 *	69.7 *	91.2 *	88.5 *	73.9 *
	LEAD	1.631	1.5 *	2.7	1 *	1.2 *	1.6 *	1 *	0.87 *
	MANGANESE	33.68	31.7 *	23.9 *	32.4 *	22.7 *	6.1 *	15.5 *	13.5 *
	MERCURY	0.0134	ND 0.0099	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *
	NICKEL	0.6769	0.62 *	0.58 *	0.74	0.6 *	0.55 *	0.71	0.58 *
	VANADIUM	0.126	ND 0.0789	0.08 *	0.14	0.1 *	0.09 *	0.09 *	ND 0.0787
	ZINC	12.19	12.1 *	9.6 *	12.7	9.7 *	7.1 *	12.8	16

Test Name	Analytes	RSA Cterm	Rabbitbrush EBB-94-15
METALS	ALUMINUM	106.6	130
	ARSENIC	0.241	0.29
	BARIUM	4.672	2.5 *
	CADMIUM	0.3042	0.23 *
	CHROMIUM	0.2775	0.3
	COPPER	4.815	4.5 *
	IRON	103.5	137
	LEAD	1.631	1.5 *
	MANGANESE	33.68	20.7 *
	MERCURY	0.0134	0.01 *
	NICKEL	0.6769	0.62 *
	VANADIUM	0.126	0.17
	ZINC	12.19	12.3

Table 5-39. Summary of Biota Sample Metal Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Sweetclover ECB-94-04	Sweetclover ECB-94-05	Sweetclover ECB-94-06	Sweetclover ECB-94-07	Sweetclover ECB-94-08	Sweetclover ECB-94-08 DUP	Sweetclover ECB-94-09
METALS	ALUMINUM	40.95	30.8 *	31 *	36.6 *	11.8 *	21.5 *	21.7861 *	ND 11.277
	ARSENIC	0.2804	ND 0.297	ND 0.2941	ND 0.297	ND 0.3	ND 0.3	ND 0.3	0.33
	BARIUM	15.43	10.4 *	20.3	12.1 *	10.8 *	12.8 *	13.0609 *	16.5
	BERYLLIUM	0.	NV	NV	NV	NV	NV	0.0092	NV
	CADMIUM	0.082	ND 0.1287	0.16	ND 0.1287	ND 0.13	ND 0.13	ND 0.13	ND 0.1287
	CHROMIUM	0.2522	0.22 *	0.26	0.2 *	0.18 *	0.2 *	0.1943 *	0.2 *
	COBALT	0.0958	0.12	0.07 *	0.08 *	ND 0.0719	ND 0.0711	ND 0.0712	ND 0.0719
	COPPER	5.9	3.4 *	4.1 *	2.3 *	13.8	2.4 *	2.4347 *	7.9
	IRON	47.33	27.6 *	32.9 *	37.7 *	14.1 *	23.3 *	23.3368 *	11.3 *
	LEAD	0.5018	0.45 *	0.38 *	0.34 *	0.31 *	0.4 *	0.33 *	0.29 *
	MANGANESE	11.2	12.9	9.2 *	6.8 *	4.1 *	8 *	8.0477 *	6.9 *
	MERCURY	0.0121	ND 0.01	0.01 *	ND 0.0098	ND 0.0098	ND 0.01	0.0107 *	0.02
	NICKEL	0.634	1.1	0.42 *	0.44 *	0.26 *	0.37 *	0.3759 *	0.32 *
	ZINC	6.422	2 *	3 *	4.8 *	2.3 *	4.9 *	4.8171 *	2.4 *

Test Name	Analytes	RSA Cterm	Sweetclover ECB-94-10	Sweetclover ECB-94-11	Sweetclover ECB-94-12	Sweetclover ECB-94-13	Sweetclover ECB-94-14	Sweetclover ECB-94-15	Sweetclover ECB-94-17
METALS	ALUMINUM	40.95	65	53.5	38.9 *	44	36.7 *	34.6 *	21.9 *
	ARSENIC	0.2804	ND 0.297	ND 0.2913	0.49	0.46	0.41	ND 0.297	ND 0.297
	BARIUM	15.43	27	17.9	11.5 *	10.1 *	8.1 *	11.9 *	7.1 *
	BERYLLIUM	0.	NV	NV	NV	NV	NV	NV	NV
	CADMIUM	0.082	ND 0.1287	ND 0.1262	ND 0.13	ND 0.13	ND 0.1287	ND 0.1287	ND 0.1287
	CHROMIUM	0.2522	0.35	0.36	0.25 *	0.22 *	0.16 *	0.22 *	0.19 *
	COBALT	0.0958	0.2	ND 0.0706	0.12	0.09 *	ND 0.0717	ND 0.0714	ND 0.07099
	COPPER	5.9	8.3	2.9 *	3.9 *	2.6 *	2.8 *	2.4 *	2 *
	IRON	47.33	84.5	55.6	48.1	51.1	44.4 *	42.5 *	23.9 *
	LEAD	0.5018	0.54	0.62	0.5 *	0.61	0.4 *	0.43 *	0.41 *
	MANGANESE	11.2	16.6	8.6 *	8.8 *	8.3 *	8.8 *	9 *	13.7
	MERCURY	0.0121	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *	0.02	0.01 *
	NICKEL	0.634	1.3	0.32 *	0.38 *	0.29 *	0.41 *	0.37 *	0.3 *
	ZINC	6.422	18.8	3 *	4.2 *	3 *	6.3 *	3.2 *	2 *

Table 5-39. Summary of Biota Sample Metal Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Sweetclover ECB-94-18	Sweetclover ECB-94-19
METALS	ALUMINUM	40.95	50.2	25.3 *
	ARSENIC	0.2804	ND 0.297	ND 0.297
	BARIUM	15.43	9.4 *	9.3 *
	BERYLLIUM	0.	NV	NV
	CADMIUM	0.082	ND 0.1287	ND 0.1287
	CHROMIUM	0.2522	0.2 *	0.17 *
	COBALT	0.0958	0.13	ND 0.07099
	COPPER	5.9	4.4 *	3.4 *
	IRON	47.33	54.8	29.4 *
	LEAD	0.5018	0.67	0.39 *
	MANGANESE	11.2	14.4	9.5 *
	MERCURY	0.0121	0.01 *	0.01 *
	NICKEL	0.634	0.63 *	0.53 *
	ZINC	6.422	4.9 *	3.3 *

Test Name	Analytes	RSA Cterm	Beetle ELB-95-01C	Beetle ELB-95-02C	Beetle ELB-95-03C
METALS	ALUMINUM	194.	171 *	156 *	194
	ANTIMONY	0.21	0.21	ND 0.1981	ND 0.2039
	ARSENIC	0.48	0.35 *	0.44 *	0.48
	BARIUM	2.6	2.2 *	2 *	2.6
	BERYLLIUM	0.01	0.01	0.01	0.01
	CADMIUM	0.15	0.15	0.11 *	0.15
	CHROMIUM	0.43	0.39 *	0.34 *	0.43
	COBALT	0.15	0.15	0.12 *	0.15
	COPPER	5.7	5.1 *	5.4 *	5.7
	IRON	213.	198 *	185 *	213
	LEAD	0.48	0.48	ND 0.3069	0.3 *
	MANGANESE	10.4	9.6 *	8.4 *	10.4
	MERCURY	0.01	0.01	0.01	0.01
	NICKEL	1.	0.66 *	0.4 *	1
	SELENIUM	0.13	0.1 *	ND 0.099	0.13
	VANADIUM	0.31	0.27 *	0.3 *	0.31
	ZINC	43.2	39.1 *	43.2	40.6 *

Table 5-39. Summary of Biota Sample Metal Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Jackrabbit EJB-94-01	Jackrabbit EJB-94-02	Jackrabbit EJB-94-03	Jackrabbit EJB-94-04	Jackrabbit EJB-94-05	Jackrabbit EJB-94-06	Jackrabbit EJB-94-07
METALS	ALUMINUM	56.46	26 *	21.8 *	17.8 *	24.7 *	38.9 *	18.4 *	25.3 *
	ANTIMONY	0.5876	ND 0.4434	ND 0.4312	ND 0.47	ND 0.47	ND 0.4563	ND 0.4352	ND 0.4393
	ARSENIC	0.1875	0.3	ND 0.2547	ND 0.25	ND 0.2455	ND 0.2673	ND 0.2596	ND 0.2455
	BARIUM	9.97	5.9 *	ND 4.3787	6.8 *	12.2	7.7 *	7.7 *	8.1 *
	BERYLLIUM	0.002	NV	NV	ND 0.004	NV	NV	ND 0.0039	ND 0.0039
	CADMIUM	0.0839	0.12	ND 0.1132	ND 0.1111	ND 0.1091	ND 0.1188	ND 0.1154	ND 0.1091
	CHROMIUM	0.4221	0.37 *	0.38 *	0.39 *	0.39 *	0.44	0.36 *	0.43
	COBALT	0.0402	ND 0.0534	ND 0.0533	ND 0.0537	ND 0.0534	ND 0.0529	ND 0.0529	ND 0.053
	COPPER	2.646	2.5 *	2.7	2.1 *	2.6 *	2.6 *	2 *	2.4 *
	IRON	116.5	95.7 *	105 *	88 *	89 *	95 *	74.9 *	96.7 *
	LEAD	20.68	0.74 *	0.26 *	33.3	26.1	19.6 *	1.5 *	0.49 *
	MANGANESE	3.53	2.3 *	1.6 *	1.8 *	3.4 *	2.6 *	1.4 *	2.7 *
	MERCURY	0.0136	0.03	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *
	NICKEL	0.1302	0.13 *	0.13 *	0.13 *	0.11 *	ND 0.098	ND 0.098	0.13 *
	SELENIUM	0.4659	0.34 *	0.36 *	ND 0.2315	0.42 *	0.27 *	0.32 *	ND 0.2273
	VANADIUM	0.0538	ND 0.0553	ND 0.0552	ND 0.0557	ND 0.0553	ND 0.0549	ND 0.0549	ND 0.055
	ZINC	21.53	22.6	21.3 *	19.5 *	21.7	20.9 *	22.6	19.2 *

Test Name	Analytes	RSA Cterm	Jackrabbit EJB-94-08	Jackrabbit EJB-94-09	Jackrabbit EJB-94-10	Jackrabbit EJB-94-11	Jackrabbit EJB-94-12	Jackrabbit EJB-94-13	Jackrabbit EJB-94-14
METALS	ALUMINUM	56.46	60.4	45.2 *	52.7 *	39.2 *	17.7 *	30.1 *	45.7 *
	ANTIMONY	0.5876	ND 0.4653	ND 0.4352	ND 0.4393	ND 0.4519	2.2	ND 0.4519	ND 0.4312
	ARSENIC	0.1875	0.36	ND 0.27	ND 0.25	ND 0.2596	ND 0.2477	ND 0.2455	ND 0.2621
	BARIUM	9.97	10.6	9.9 *	12.3	6.6 *	5.7 *	8.5 *	12.5
	BERYLLIUM	0.002	NV	NV	NV	ND 0.004	NV	NV	ND 0.004
	CADMIUM	0.0839	ND 0.1143	ND 0.12	ND 0.1111	ND 0.1154	ND 0.1101	ND 0.1091	0.14
	CHROMIUM	0.4221	0.4 *	0.38 *	0.39 *	0.38 *	0.42 *	0.37 *	0.39 *
	COBALT	0.0402	ND 0.053	ND 0.053	ND 0.0529	ND 0.0539	ND 0.0539	ND 0.0533	ND 0.0537
	COPPER	2.646	2.4 *	2.8	2.6 *	2.3 *	2.4 *	2.8	2.8
	IRON	116.5	139	122	106 *	101 *	85.2 *	90.4 *	99.9 *
	LEAD	20.68	12 *	0.5 *	23.7	3 *	1.3 *	0.45 *	56.7
	MANGANESE	3.53	3.5 *	2.3 *	3.6	2.7 *	2.5 *	2.5 *	3.7
	MERCURY	0.0136	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *	0.01 *
	NICKEL	0.1302	ND 0.0982	0.11 *	0.12 *	0.12 *	0.13 *	0.14	0.15
	SELENIUM	0.4659	0.48	0.58	0.4 *	0.45 *	0.62	0.42 *	0.6
	VANADIUM	0.0538	ND 0.055	NV	NV	NV	ND 0.0559	ND 0.0552	ND 0.0557
	ZINC	21.53	19.5 *	19.8 *	20.1 *	19.1 *	22.6	20.5 *	20.7 *

Table 5-39. Summary of Biota Sample Metal Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Grasshopper EGB-95-01C	Grasshopper EGB-95-02C	Grasshopper EGB-95-03C	Grasshopper EGB-95-04C	Grasshopper EGB-95-05C	Grasshopper EGB-95-06C	Grasshopper EGB-95-07C
METALS	ALUMINUM	62.43	51.9 *	63.3	52.5 *	38.6 *	66	62.3 *	55.4 *
	BARIUM	1.994	1.7 *	2	1.5 *	1.6 *	2.4	1.7 *	1.8 *
	CADMIUM	0.5006	0.39 *	0.39 *	0.43 *	0.4 *	0.11 *	0.33 *	0.35 *
	CHROMIUM	0.3676	0.32 *	0.29 *	0.47	0.43	0.3 *	0.32 *	0.25 *
	COBALT	0.1143	0.08 *	0.11 *	0.1 *	0.09 *	0.1 *	0.11 *	0.11 *
	COPPER	21.21	20.7 *	20.3 *	23.2	21.9	18.5 *	19.7 *	16.8 *
	IRON	79.76	69.5 *	80.7	68.8 *	55.1 *	77.7 *	81.9	72.8 *
	LEAD	0.523	0.41 *	0.63	ND 0.301	0.42 *	ND 0.287	0.39 *	0.37 *
	MANGANESE	6.523	6.1 *	7.9	4.7 *	4.9 *	6.8	6 *	5.8 *
	MERCURY	0.	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	NICKEL	0.5127	0.43 *	0.44 *	0.51 *	0.66	ND 0.3917	0.51 *	ND 0.3893
	SELENIUM	0.2014	0.14 *	0.19 *	0.19 *	0.23	ND 0.0926	0.11 *	0.2 *
	SILVER	0.0581	0.1	ND 0.0837	ND 0.0833	ND 0.0833	ND 0.0835	ND 0.0832	ND 0.083
	VANADIUM	0.1233	0.09 *	0.12 *	0.11 *	0.08 *	0.13	0.11 *	0.12 *
	ZINC	57.77	67.9	57.2 *	53.6 *	55 *	49.5 *	54.9 *	52.9 *

Test Name	Analytes	RSA Cterm	Grasshopper EGB-95-08C	Grasshopper EGB-95-09C	Grasshopper EGB-95-10C
METALS	ALUMINUM	62.43	50 *	58.8 *	71.2
	BARIUM	1.994	1.7 *	1.7 *	2.2
	CADMIUM	0.5006	0.52	0.29 *	0.79
	CHROMIUM	0.3676	0.31 *	0.28 *	0.31 *
	COBALT	0.1143	0.09 *	0.09 *	0.15
	COPPER	21.21	22.1	17.5 *	19.5 *
	IRON	79.76	67.5 *	78.3 *	89.6
	LEAD	0.523	0.42 *	0.39 *	0.79
	MANGANESE	6.523	5.1 *	5.3 *	6.8
	MERCURY	0.	0.01	ND 0.00959	0.01
	NICKEL	0.5127	0.44 *	0.47 *	0.46 *
	SELENIUM	0.2014	0.23	0.17 *	0.18 *
	SILVER	0.0581	ND 0.0837	ND 0.0825	ND 0.083
	VANADIUM	0.1233	0.12 *	0.11 *	0.14
	ZINC	57.77	52.3 *	53.9 *	51.1 *

Table 5-39. Summary of Biota Sample Metal Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Jackrabbit EJB-94-14 DUP	Jackrabbit EJB-94-15
METALS	ALUMINUM	56.46	45.2045 *	153
	ANTIMONY	0.5876	0.5943	ND 0.4476
	ARSENIC	0.1875	0.3429	ND 0.2621
	BARIUM	9.97	12.5849	12.3
	BERYLLIUM	0.002	0.0079	NV
	CADMIUM	0.0839	0.12	0.12
	CHROMIUM	0.4221	0.4402	0.54
	COBALT	0.0402	0.0821	0.1
	COPPER	2.646	2.7425	2.9
	IRON	116.5	101.2535 *	181
	LEAD	20.68	56.3057	17.8 *
	MANGANESE	3.53	3.7138	7.1
	MERCURY	0.0136	0.0131 *	0.01 *
	NICKEL	0.1302	0.1603	0.16
	SELENIUM	0.4659	0.4836	0.46 *
	VANADIUM	0.0538	ND 0.0557	0.17
	ZINC	21.53	21.0537 *	23.3

Note.—All values in mg/kg (equal to ppm).
RSA=Reference Study Area.
Cterm=Concentration Term.
*=Analyte concentration is less than Cterm.
NV=Not a Valid Detect.
ND=Analyte not detected in sample.
DUP=Duplicate analysis.

Table 5-40. Summary of Biota Sample Dioxin/Furans Results for the Reference Study Area (RSA)

Test Name	Analytes	RSA Cterm	Gumweed EMB-94-01	Gumweed EMB-94-05	Gumweed EMB-94-06	Gumweed EMB-94-11	Gumweed EMB-94-12	Gumweed EMB-94-15
DIOXIN	1,2,3,7,8-PENTACHLORODIBENZOFURAN	0.2897	ND 0.491	ND 0.082	ND 0.133	0.1182 *	ND 0.295	ND 0.224
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.2992	ND 0.473	ND 0.079	ND 0.129	0.2497 *	ND 0.285	ND 0.216
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.6295	ND 0.462	NV	0.85229	0.8294	ND 0.24	ND 0.187
	OCTACHLORODIBENZODIOXIN	2.5	ND 1.82	1.5889 *	2.3639 *	0.7437 *	NV	NV
	OCTACHLORODIBENZOFURAN	1.11	ND 1.54	0.4279 *	ND 0.616	ND 0.257	ND 1.762	ND 1.109
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.9946	ND 1.4	ND 0.266	0.6201 *	ND 0.222	ND 1.305	0.80489 *
	TOTAL HEXACHLORODIBENZOFURANS	0.3963	ND 0.636	0.292 *	ND 0.172	0.2787 *	ND 0.398	ND 0.344
	TOTAL PENTACHLORODIBENZOFURANS	0.4507	ND 0.482	ND 0.08	NV	0.737	ND 0.29	ND 0.22
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.3008	ND 0.56699	ND 0.08799	0.1775 *	ND 0.07	ND 0.284	ND 0.236
	TOTAL TETRACHLORODIBENZOFURANS	1.254	ND 0.462	1.1428 *	1.7252	1.4944	ND 0.24	ND 0.187

Test Name	Analytes	RSA Cterm	Gumweed EMB-94-18
DIOXIN	1,2,3,7,8-PENTACHLORODIBENZOFURAN	0.2897	ND 0.992
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.2992	ND 0.957
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.6295	ND 0.842
	OCTACHLORODIBENZODIOXIN	2.5	NV
	OCTACHLORODIBENZOFURAN	1.11	ND 3.647
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	0.9946	ND 3.032
	TOTAL HEXACHLORODIBENZOFURANS	0.3963	ND 1.192
	TOTAL PENTACHLORODIBENZOFURANS	0.4507	ND 0.974
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.3008	ND 0.979
	TOTAL TETRACHLORODIBENZOFURANS	1.254	ND 0.842

Test Name	Analytes	RSA Cterm	Rabbitbrush EBB-94-01	Rabbitbrush EBB-94-02	Rabbitbrush EBB-94-03	Rabbitbrush EBB-94-04	Rabbitbrush EBB-94-05	Rabbitbrush EBB-94-06
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	ND 0.418	ND 0.527	ND 0.474	ND 1.12	ND 1.275	ND 2.997
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	ND 0.262	ND 0.315	ND 0.212	ND 0.679	ND 0.73	ND 1.686
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3154	ND 0.268	ND 0.321	ND 0.151	ND 0.631	ND 0.651	ND 1.327
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.2849	ND 0.253	ND 0.302	ND 0.145	ND 0.595	ND 0.614	ND 1.252
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2301	ND 0.182	ND 0.233	ND 0.078	ND 0.407	ND 0.375	ND 0.524
	OCTACHLORODIBENZODIOXIN	4.11	ND 0.536	ND 0.697	ND 0.872	ND 1.451	ND 2.014	ND 5.703
	OCTACHLORODIBENZOFURAN	1.127	ND 0.439	ND 0.572	ND 0.738	ND 1.191	ND 1.652	ND 4.679
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	ND 0.418	ND 0.527	ND 0.474	ND 1.12	ND 1.275	ND 2.997
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	ND 0.318	ND 0.382	ND 0.263	ND 0.824	ND 0.885	ND 2.045
	TOTAL HEXACHLORODIBENZOFURANS	1.145	ND 0.245	ND 0.293	ND 0.143	ND 0.576	ND 0.594	ND 1.212
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.3483	ND 0.4	ND 0.536	ND 0.177	ND 1.027	ND 0.963	ND 1.602
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	ND 0.251	ND 0.339	ND 0.096	ND 0.626	ND 0.626	ND 1.027
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.203	ND 0.227	ND 0.303	ND 0.098	ND 0.54	ND 0.509	ND 0.719
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	ND 0.182	ND 0.233	ND 0.078	ND 0.407	ND 0.375	ND 0.52

Table 5-40. Summary of Biota Sample Dioxin/Furans Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Rabbitbrush EBB-94-07	Rabbitbrush EBB-94-08	Rabbitbrush EBB-94-09	Rabbitbrush EBB-94-10	Rabbitbrush EBB-94-11	Rabbitbrush EBB-94-12
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	ND 1.034	ND 0.217	ND 0.216	0.8873 *	ND 1.182	1.3161
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	ND 0.555	0.2905 *	0.2548 *	1.9925	ND 0.54	ND 0.116
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3154	ND 0.498	ND 0.093	ND 0.092	0.7256	ND 0.421	ND 0.115
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.2849	ND 0.47	ND 0.09	0.2468 *	NV	ND 0.404	0.3294
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2301	ND 0.244	ND 0.068	ND 0.078	0.2934	ND 0.217	ND 0.069
	OCTACHLORODIBENZODIOXIN	4.11	ND 1.581	ND 0.307	ND 0.303	2.8749 *	ND 1.84	7.745
	OCTACHLORODIBENZOFURAN	1.127	ND 1.297	0.6245 *	0.5376 *	2.6297	ND 1.558	0.9331 *
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	ND 1.034	ND 0.217	ND 0.216	0.8873 *	ND 1.182	2.7833
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	ND 0.673	0.2905 *	0.2548 *	1.9925	ND 0.671	ND 0.144
	TOTAL HEXACHLORODIBENZOFURANS	1.145	ND 0.455	ND 0.08799	0.2468 *	5.0361	ND 0.398	0.5876 *
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.3483	ND 0.669	ND 0.132	ND 0.142	0.2637 *	ND 0.551	0.1879 *
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	ND 0.422	0.1014 *	ND 0.084	NV	ND 0.275	0.1825 *
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.203	ND 0.332	0.1304 *	0.1225 *	0.1185 *	ND 0.253	ND 0.085
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	ND 0.244	0.1125 *	ND 0.078	0.583	ND 0.217	ND 0.069

Test Name	Analytes	RSA Cterm	Rabbitbrush EBB-94-13	Rabbitbrush EBB-94-14	Rabbitbrush EBB-94-15
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9764	1.0776	0.8153 *	2.0177
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.6498	0.5429 *	ND 0.187	0.6992
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3154	ND 0.224	ND 0.153	ND 0.131
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.2849	ND 0.211	ND 0.144	NV
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2301	0.3442	0.5449	ND 0.062
	OCTACHLORODIBENZODIOXIN	4.11	6.4279	4.6461	10.3597
	OCTACHLORODIBENZOFURAN	1.127	0.74339 *	ND 0.501	ND 0.357
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.511	1.9342	0.8153 *	3.9595
	TOTAL HEPTACHLORODIBENZOFURANS	0.7344	0.5429 *	ND 0.227	1.1676
	TOTAL HEXACHLORODIBENZOFURANS	1.145	ND 0.204	ND 0.14	0.6113 *
	TOTAL PENTACHLORODIBENZO-P-DIOXIN	0.3483	ND 0.204	ND 0.149	ND 0.119
	TOTAL PENTACHLORODIBENZOFURANS	0.2648	ND 0.128	0.3435	0.2432 *
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.203	ND 0.115	0.1707 *	0.2813
	TOTAL TETRACHLORODIBENZOFURANS	0.5073	0.6423	1.715	0.4032 *

Table 5-40. Summary of Biota Sample Dioxin/Furans Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Sweetclover ECB-94-04	Sweetclover ECB-94-05	Sweetclover ECB-94-06	Sweetclover ECB-94-07	Sweetclover ECB-94-08	Sweetclover ECB-94-09
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9342	ND 0.222	ND 1.203	0.8089 *	ND 0.255	ND 0.525	ND 1.172
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	2.033	ND 0.116	ND 0.56599	0.3431 *	ND 0.127	ND 0.253	ND 0.51
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.2923	ND 0.192	ND 0.93999	ND 0.369	ND 0.194	ND 0.417	ND 0.802
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3511	ND 0.105	ND 0.649	ND 0.196	ND 0.106	ND 0.214	ND 0.493
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.2872	ND 0.16	ND 0.93999	ND 0.309	ND 0.163	ND 0.348	ND 0.802
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.1894	ND 0.084	ND 0.475	ND 0.156	ND 0.084	ND 0.171	ND 0.361
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.2824	ND 0.174	ND 0.86	ND 0.335	ND 0.176	ND 0.378	ND 0.733
	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	0.209	ND 0.113	ND 0.705	ND 0.21	ND 0.113	ND 0.229	ND 0.536
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3477	0.2876 *	ND 0.582	0.2668 *	0.2804 *	ND 0.206	ND 0.442
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.1538	ND 0.073	ND 0.461	ND 0.129	ND 0.07099	ND 0.127	ND 0.274
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2478	NV	ND 0.229	NV	NV	NV	ND 0.189
	OCTACHLORODIBENZODIOXIN	7.662	NV	ND 1.788	NV	NV	NV	ND 2.193
	OCTACHLORODIBENZOFURAN	4.013	0.3882 *	ND 1.483	ND 0.552	ND 0.312	ND 0.64	ND 1.819
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.616	0.2863 *	ND 1.203	1.407 *	ND 0.255	ND 0.525	ND 1.172
	TOTAL HEPTACHLORODIBENZOFURANS	2.184	ND 0.144	ND 0.686	0.8075 *	ND 0.157	ND 0.314	ND 0.618
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.5397	ND 0.174	ND 0.912	ND 0.336	ND 0.177	ND 0.379	ND 0.777
	TOTAL HEXACHLORODIBENZOFURANS	0.9658	0.2876 *	ND 0.589	0.2668 *	0.2804 *	ND 0.203	ND 0.448
	TOTAL PENTACHLORODIBENZOFURANS	0.2157	0.1666 *	ND 0.471	ND 0.131	0.1219 *	ND 0.13	ND 0.28
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.1402	ND 0.095	ND 0.506	ND 0.145	0.1458	ND 0.151	ND 0.274
	TOTAL TETRACHLORODIBENZOFURANS	0.3733	1.0876	ND 0.229	ND 0.126	0.53	ND 0.12	ND 0.189

Test Name	Analytes	RSA Cterm	Sweetclover ECB-94-10	Sweetclover ECB-94-11	Sweetclover ECB-94-12	Sweetclover ECB-94-13	Sweetclover ECB-94-13 DUP	Sweetclover ECB-94-14
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9342	ND 0.879	ND 0.625	3.1923	1.0926	0.8672 *	ND 0.786
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	2.033	ND 0.413	ND 0.277	ND 0.18	ND 0.215	0.5222 *	0.9468 *
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.2923	ND 0.641	ND 0.436	ND 0.281	ND 0.333	ND 0.162	0.5613
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3511	ND 0.446	ND 0.3	ND 0.151	ND 0.154	0.1838 *	ND 0.234
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.2872	ND 0.641	ND 0.436	0.1411 *	ND 0.279	ND 0.135	0.5993
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.1894	ND 0.326	ND 0.22	ND 0.121	ND 0.123	ND 0.06	0.4448
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.2824	ND 0.586	ND 0.398	0.25 *	ND 0.302	ND 0.147	0.5697
	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	0.209	ND 0.484	ND 0.326	ND 0.162	ND 0.165	ND 0.081	0.4784
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3477	0.4137	0.2024 *	ND 0.145	ND 0.148	0.3124 *	0.7758
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.1538	ND 0.281	ND 0.187	ND 0.089	ND 0.097	0.0906 *	0.4677
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2478	ND 0.223	ND 0.147	NV	NV	0.2131 *	NV
	OCTACHLORODIBENZODIOXIN	7.662	ND 1.466	ND 1.122	32.1442	NV	6.5436 *	NV
	OCTACHLORODIBENZOFURAN	4.013	ND 1.215	ND 0.93	1.6291 *	1.6449 *	0.8619 *	ND 1.103
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.616	ND 0.879	ND 0.625	6.2902	1.0926 *	1.7207	ND 0.786
	TOTAL HEPTACHLORODIBENZOFURANS	2.184	ND 0.5	ND 0.336	0.4513 *	ND 0.267	0.5222 *	0.9468 *
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.5397	ND 0.621	ND 0.422	0.655	ND 0.303	0.1935 *	1.7304
	TOTAL HEXACHLORODIBENZOFURANS	0.9658	0.4137 *	0.2024 *	0.1953 *	ND 0.146	0.6786 *	1.699
	TOTAL PENTACHLORODIBENZOFURANS	0.2157	ND 0.287	ND 0.191	0.2256	ND 0.099	0.2486	0.4677
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.1402	ND 0.321	ND 0.22	0.1485	ND 0.09	0.1615	ND 0.143
	TOTAL TETRACHLORODIBENZOFURANS	0.3733	ND 0.223	ND 0.147	0.3159 *	0.1894 *	0.2131 *	0.4582

Table 5-40. *Summary of Biota Sample Dioxin/Furans Results for the Reference Study Area (RSA) (continued)*

Test Name	Analytes	RSA Cterm	Sweetclover ECB-94-15	Sweetclover ECB-94-17	Sweetclover ECB-94-18	Sweetclover ECB-94-19
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	0.9342	ND 0.28	ND 0.217	ND 0.703	ND 0.405
	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	2.033	10.0311	0.1706 *	ND 0.295	0.1984 *
	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.2923	ND 0.185	ND 0.132	ND 0.433	ND 0.26
	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0.3511	1.3381	ND 0.061	ND 0.205	ND 0.117
	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0.2872	ND 0.155	ND 0.111	ND 0.362	ND 0.218
	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	0.1894	0.3456	ND 0.049	ND 0.163	ND 0.094
	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	0.2824	ND 0.168	ND 0.12	ND 0.393	ND 0.236
	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	0.209	ND 0.093	ND 0.066	ND 0.219	ND 0.126
	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0.3477	0.414	0.2655 *	0.2604 *	ND 0.113
	2,3,4,7,8-PENTACHLORODIBENZOFURAN	0.1538	ND 0.058	ND 0.035	ND 0.138	ND 0.075
	2,3,7,8 TETRACHLORODIBENZOFURAN	0.2478	NV	NV	ND 0.104	NV
	OCTACHLORODIBENZODIOXIN	7.662	NV	NV	NV	NV
	OCTACHLORODIBENZOFURAN	4.013	18.9047	0.4099 *	ND 0.976	0.3996 *
	TOTAL HEPTACHLORODIBENZO-P-DIOXIN	1.616	1.1045 *	0.27 *	ND 0.703	0.2683 *
	TOTAL HEPTACHLORODIBENZOFURANS	2.184	10.4811	0.1706 *	ND 0.366	0.1984 *
	TOTAL HEXACHLORODIBENZO-P-DIOXINS	0.5397	0.4395 *	ND 0.12	ND 0.394	ND 0.236
	TOTAL HEXACHLORODIBENZOFURANS	0.9658	3.5699	0.2655 *	0.2604 *	ND 0.111
	TOTAL PENTACHLORODIBENZOFURANS	0.2157	0.4	0.0803 *	ND 0.141	ND 0.076
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.1402	0.1466	0.0572 *	ND 0.128	0.1683
	TOTAL TETRACHLORODIBENZOFURANS	0.3733	ND 0.042	0.3231 *	ND 0.104	0.1979 *

Test Name	Analytes	RSA Cterm	Beetle ELB-95-01C	Beetle ELB-95-02C	Beetle ELB-95-03C
DIOXIN	TOTAL TETRACHLORODIBENZO-P-DIOXINS	50.04	1.479 *	1.0665 *	50.0395 *

Test Name	Analytes	RSA Cterm	Grasshopper EGB-95-01C	Grasshopper EGB-95-02C	Grasshopper EGB-95-03C	Grasshopper EGB-95-04C	Grasshopper EGB-95-05C	Grasshopper EGB-95-06C
DIOXIN	TOTAL HEXACHLORODIBENZOFURANS	0.3216	0.2473 *	ND 0.006	0.3547	0.3354	0.2873 *	0.2677 *
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.3785	ND 0.131	ND 0.186	ND 0.197	ND 0.217	ND 0.27	ND 0.133

Test Name	Analytes	RSA Cterm	Grasshopper EGB-95-07C	Grasshopper EGB-95-08C	Grasshopper EGB-95-09C	Grasshopper EGB-95-10C
DIOXIN	TOTAL HEXACHLORODIBENZOFURANS	0.3216	0.2871 *	ND 0.63	ND 0.578	0.2625 *
	TOTAL TETRACHLORODIBENZO-P-DIOXINS	0.3785	ND 0.126	ND 0.81	ND 0.791	0.8608

Table 5-40. *Summary of Biota Sample Dioxin/Furans Results for the Reference Study Area (RSA) (continued)*

Test Name	Analytes	RSA Cterm	Jackrabbit EJB-94-01	Jackrabbit EJB-94-02	Jackrabbit EJB-94-03	Jackrabbit EJB-94-04	Jackrabbit EJB-94-05	Jackrabbit EJB-94-06
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.208	ND 0.153	ND 0.38	ND 0.482	ND 0.81	ND 0.214	ND 0.251
	OCTACHLORODIBENZODIOXIN	0.5084	ND 0.38	ND 1.299	ND 1.187	ND 1.802	NV	ND 0.592
	TOTAL HEPTACHLORODIBENZOFURANS	0.2521	ND 0.185	ND 0.462	ND 0.585	ND 0.983	ND 0.26	ND 0.305
	TOTAL HEXACHLORODIBENZOFURANS	0.1651	ND 0.118	ND 0.31	ND 0.426	ND 0.484	ND 0.169	ND 0.216
	TOTAL PENTACHLORODIBENZOFURANS	0.1556	ND 0.1	ND 0.277	ND 0.394	ND 0.394	ND 0.159	ND 0.225
	TOTAL TETRACHLORODIBENZOFURANS	0.2096	ND 0.063	ND 0.169	ND 0.275	ND 0.33	ND 0.115	ND 0.156

Test Name	Analytes	RSA Cterm	Jackrabbit EJB-94-07	Jackrabbit EJB-94-08	Jackrabbit EJB-94-09	Jackrabbit EJB-94-10	Jackrabbit EJB-94-11	Jackrabbit EJB-94-12
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.208	ND 0.243	ND 0.161	ND 0.678	ND 0.238	ND 0.506	ND 0.22
	OCTACHLORODIBENZODIOXIN	0.5084	ND 0.81699	ND 0.409	ND 1.45	ND 0.675	ND 0.93899	ND 0.663
	TOTAL HEPTACHLORODIBENZOFURANS	0.2521	ND 0.295	ND 0.195	ND 0.822	ND 0.288	ND 0.614	ND 0.267
	TOTAL HEXACHLORODIBENZOFURANS	0.1651	ND 0.197	0.1929	ND 0.584	ND 0.179	ND 0.317	ND 0.173
	TOTAL PENTACHLORODIBENZOFURANS	0.1556	ND 0.19	ND 0.082	ND 0.603	ND 0.166	ND 0.256	ND 0.155
	TOTAL TETRACHLORODIBENZOFURANS	0.2096	ND 0.132	ND 0.056	ND 0.408	ND 0.125	ND 0.227	ND 0.102

Test Name	Analytes	RSA Cterm	Jackrabbit EJB-94-13	Jackrabbit EJB-94-14	Jackrabbit EJB-94-14 DUP	Jackrabbit EJB-94-15
DIOXIN	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0.208	0.0479 *	ND 0.265	ND 0.586	ND 0.103
	OCTACHLORODIBENZODIOXIN	0.5084	0.1905 *	ND 0.879	ND 1.076	ND 0.207
	TOTAL HEPTACHLORODIBENZOFURANS	0.2521	0.0479 *	ND 0.322	ND 0.711	ND 0.125
	TOTAL HEXACHLORODIBENZOFURANS	0.1651	ND 0.043	ND 0.21	ND 0.339	ND 0.094
	TOTAL PENTACHLORODIBENZOFURANS	0.1556	ND 0.032	ND 0.181	ND 0.277	0.2075
	TOTAL TETRACHLORODIBENZOFURANS	0.2096	ND 0.032	ND 0.109	ND 0.245	0.75549

Note.—All values in ng/kg (equal to ppt).
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
NV=Not a Valid Detect.
*=Analyte concentration is less than Cterm.
DUP=Duplicate analysis.

Table 5-41. Summary of Remaining Biota Sample Analytical Results for the Reference Study Area (RSA)

Test Name	Analytes	RSA Cterm	Sweetclover ECB-94-04	Sweetclover ECB-94-04 DUP	Sweetclover ECB-94-05	Sweetclover ECB-94-06	Sweetclover ECB-94-07	Sweetclover ECB-94-08
EXPLOSIVES	2,4,6-TRINITROTOLUENE	139.2	270	NS	ND 220	ND 220	ND 220	ND 220
	RDX	492.	ND 410	NS	ND 400	ND 400	ND 410	ND 400
HERBICIDE	2,4-D	3,107.	ND 1300	ND 1300	ND 1300	ND 1300	ND 1300	ND 1300
PAH	CHRYSENE	0.3707	ND 0.62	NS	ND 0.62	ND 0.62	ND 0.62	ND 0.62
	FLUORANTHENE	0.8689	ND 0.6	NS	0.99	ND 0.6	ND 0.6	0.68999 *
	PHENANTHRENE	3.123	NV	NS	3.4	2.2 *	ND 1.4	2.9 *
	PYRENE	0.3947	NV	NS	0.45	0.39 *	ND 0.22	ND 0.22

Test Name	Analytes	RSA Cterm	Sweetclover ECB-94-09	Sweetclover ECB-94-10	Sweetclover ECB-94-11	Sweetclover ECB-94-12	Sweetclover ECB-94-13	Sweetclover ECB-94-14
EXPLOSIVES	2,4,6-TRINITROTOLUENE	139.2	ND 220	ND 220	ND 220	ND 220	ND 220	ND 220
	RDX	492.	ND 400	ND 400	ND 410	ND 410	ND 410	ND 400
HERBICIDE	2,4-D	3,107.	ND 1300	14000	ND 1300	ND 1300	ND 1300	ND 1300
PAH	CHRYSENE	0.3707	ND 0.62	0.64	ND 0.62	ND 0.62	ND 0.62	ND 0.62
	FLUORANTHENE	0.8689	ND 0.6	ND 0.6	1.4	1.1	1.1	0.89
	PHENANTHRENE	3.123	ND 1.4	1.8 *	4.5	5.1	3.6	2.5 *
	PYRENE	0.3947	ND 0.22	0.58	0.48	0.55	0.34 *	0.35 *

Test Name	Analytes	RSA Cterm	Sweetclover ECB-94-15	Sweetclover ECB-94-17	Sweetclover ECB-94-18	Sweetclover ECB-94-19
EXPLOSIVES	2,4,6-TRINITROTOLUENE	139.2	ND 220	ND 210	ND 220	ND 220
	RDX	492.	ND 400	ND 390	420 *	1700
HERBICIDE	2,4-D	3,107.	ND 1300	ND 1300	ND 1300	ND 1300
PAH	CHRYSENE	0.3707	ND 0.62	ND 0.62	ND 0.62	ND 0.62
	FLUORANTHENE	0.8689	0.73 *	0.71 *	0.73 *	0.79 *
	PHENANTHRENE	3.123	2.9 *	2.2 *	2.5 *	2.3 *
	PYRENE	0.3947	0.28 *	0.28 *	0.33 *	0.37 *

Test Name	Analytes	RSA Cterm	Beetle ELB-95-01C	Beetle ELB-95-02C	Beetle ELB-95-03C
PESTICIDES	DDE	5.5	5.5	2 *	3.1 *

Test Name	Analytes	RSA Cterm	Grasshopper EGB-95-01C	Grasshopper EGB-95-02C	Grasshopper EGB-95-03C	Grasshopper EGB-95-04C	Grasshopper EGB-95-05C	Grasshopper EGB-95-06C
PESTICIDES	DDT	0.4759	ND 0.43	0.66	ND 0.43	ND 0.43	0.61	ND 0.43

Test Name	Analytes	RSA Cterm	Grasshopper EGB-95-07C	Grasshopper EGB-95-08C	Grasshopper EGB-95-09C	Grasshopper EGB-95-10C
PESTICIDES	DDT	0.4759	ND 0.43	0.72	ND 0.43	ND 0.43

Table 5-41. Summary of Remaining Biota Sample Analytical Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Gumweed EMB-94-01	Gumweed EMB-94-05	Gumweed EMB-94-06	Gumweed EMB-94-11	Gumweed EMB-94-12	Gumweed EMB-94-15
PAH	PHENANTHRENE	9.39	ND 3.39	ND 3.39	ND 3.4	3.9 *	8.2 *	12

Test Name	Analytes	RSA Cterm	Gumweed EMB-94-18
PAH	PHENANTHRENE	9.39	12

Test Name	Analytes	RSA Cterm	Rabbitbrush EBB-94-01	Rabbitbrush EBB-94-01 DUP	Rabbitbrush EBB-94-02	Rabbitbrush EBB-94-03	Rabbitbrush EBB-94-04	Rabbitbrush EBB-94-05
EXPLOSIVES	2,4,6-TRINITROTOLUENE	11,553.	ND 5700	NS	ND 5200	ND 5700	8700 *	ND 5700
PAH	CHRYSENE	0.5024	ND 0.83	NS	ND 0.83	ND 0.83	ND 0.83	ND 0.83
	FLUORANTHENE	2.227	ND 1.3	NS	1.5 *	2 *	2.1 *	2.1 *
	PHENANTHRENE	7.8	ND 3.7	NS	ND 3.7	ND 3.7	3.8 *	5 *
	PYRENE	0.78	0.4 *	NS	0.74 *	0.83	0.83	0.76 *
PESTICIDES	DDE	61.56	ND 34	NS	ND 34	91	ND 34	ND 34

Test Name	Analytes	RSA Cterm	Rabbitbrush EBB-94-06	Rabbitbrush EBB-94-07	Rabbitbrush EBB-94-08	Rabbitbrush EBB-94-09	Rabbitbrush EBB-94-10	Rabbitbrush EBB-94-11
EXPLOSIVES	2,4,6-TRINITROTOLUENE	11,553.	ND 5700	ND 5200	ND 5700	ND 5200	ND 5700	ND 5200
PAH	CHRYSENE	0.5024	ND 0.83	ND 0.83	0.89	ND 0.83	ND 0.83	ND 0.83
	FLUORANTHENE	2.227	2 *	2.2 *	2.4	1.3 *	2.5	ND 1.3
	PHENANTHRENE	7.8	7 *	5.5 *	10	ND 3.7	5.7 *	ND 3.7
	PYRENE	0.78	0.64 *	NV	1.1	0.6 *	0.73 *	0.6 *
PESTICIDES	DDE	61.56	ND 34	ND 34	ND 34	130	ND 34	ND 34

Test Name	Analytes	RSA Cterm	Rabbitbrush EBB-94-12	Rabbitbrush EBB-94-13	Rabbitbrush EBB-94-14	Rabbitbrush EBB-94-15
EXPLOSIVES	2,4,6-TRINITROTOLUENE	11,553.	30000	13000	22000	14000
PAH	CHRYSENE	0.5024	ND 0.83	ND 0.83	ND 0.83	ND 0.83
	FLUORANTHENE	2.227	2.4	2.9	2.3	2 *
	PHENANTHRENE	7.8	11	14	11	7.4 *
	PYRENE	0.78	ND 0.31	1	0.68 *	0.68 *
PESTICIDES	DDE	61.56	110	110	ND 34	ND 34

Table 5-41. Summary of Remaining Biota Sample Analytical Results for the Reference Study Area (RSA) (continued)

Test Name	Analytes	RSA Cterm	Jackrabbit EJB-94-01	Jackrabbit EJB-94-01 DUP	Jackrabbit EJB-94-02	Jackrabbit EJB-94-03	Jackrabbit EJB-94-04	Jackrabbit EJB-94-05
PESTICIDES	DDE	0.7335	ND 0.67	NS	ND 0.67	ND 0.67	ND 0.67	ND 0.67

Test Name	Analytes	RSA Cterm	Jackrabbit EJB-94-06	Jackrabbit EJB-94-07	Jackrabbit EJB-94-08	Jackrabbit EJB-94-09	Jackrabbit EJB-94-10	Jackrabbit EJB-94-11
PESTICIDES	DDE	0.7335	ND 0.67	ND 0.67	ND 0.67	ND 0.67	ND 0.67	2.5

Test Name	Analytes	RSA Cterm	Jackrabbit EJB-94-12	Jackrabbit EJB-94-13	Jackrabbit EJB-94-14	Jackrabbit EJB-94-14 DUP	Jackrabbit EJB-94-15
PESTICIDES	DDE	0.7335	ND 0.67	ND 0.67	ND 0.67	ND 0.67	ND 0.67

Note.—All values in $\mu g/kg$ (equal to ppb).
PAH=Polynuclear Aromatic Hydrocarbon.
RSA=Reference Study Area.
Cterm=Concentration Term.
ND=Analyte not detected in sample.
*=Analyte concentration is less than Cterm.
DUP=Duplicate analysis.
NS=Matrix not sampled at this location.
NV=Not a Valid Detect.

("B") to 0.59 ppm), chromium (0.16 ("B") to 0.35 ppm), copper (2.5 to 6.4 ppm), and iron (47.5 to 186 ppm) were detected in all 15 samples. Mercury, in 14 of 15 samples, ranged from 0.01 to 0.03 ppm. Manganese (6.1 to 47.1 ppm), nickel (0.30 ("B") to 0.95 ppm), and lead (0.39 to 2.7 ppm) were detected in all 15 samples. Vanadium was detected in 10 of 15 samples at concentrations ranging from 0.08 to 0.27 ppm (all values "B" qualified). Zinc, in all 15 samples, ranged from 7.1 to 16 ppm.

The RSA jackrabbit samples (EJB-94-01 through -15 plus a laboratory duplicate for EJB-94-14) contained up to 16 metals above detection limits. Aluminum, detected in all 16 samples, ranged in concentration from 17.7 to 153 ppm. Arsenic was detected in 3 of 15 samples, ranging from 0.30 to 0.36 ppm (all values "B" qualified). Barium, in 15 of 16 samples, ranged from 5.7 to 12.6 ppm. Beryllium was detected in one sample at a concentration of 0.008 ppm ("B"). Cadmium, in only four samples, ranged from 0.12 to 0.14 ppm (all values "B" qualified). Chromium (0.36 to 0.54 ppm), copper (2.0 to 2.9 ppm), iron (75 to 181 ppm), mercury (0.01 to 0.03 ppm), and manganese (1.4 to 7.1 ppm) were detected in all 16 samples. Nickel, in 13 of 16 samples, ranged from 0.11 to 0.16 ppm (all values "B" qualified). Lead was detected in all 16 samples with a wide range of concentrations from 0.26 ("B") to 56.7 ppm. Selenium, detected in 14 of 16 samples, ranged from 0.27 ("B") to 0.62 ppm. Zinc, in all 16 samples, ranged from 19.1 to 23.3 ppm. Cobalt was detected in two samples, EJB-94-14 duplicate (0.08 ppm ("B")) and EJB-94-15 (0.1 ppm ("B")). Antimony was also detected in two samples with "B" qualified values of 0.59 and 2.2 ppm. Vanadium was detected in EJB-94-15 at 0.17 ppm.

Fourteen metals were detected in three of the composite beetle samples from the RSA (ELB-95-01C, ELB-95-02C, and ELB-95-03C). The metals and the range of their reported detection values in ppm are as follows: aluminum (156 to 194), arsenic (0.35 to 0.48), barium (2.0 to 2.6), beryllium (0.01 for all three samples), cadmium (0.11 to 0.15), cobalt (0.12 to 0.15), chromium (0.34 to 0.43), copper (5.1 to 5.7), iron (185 to 213), mercury (0.01 for all three samples), manganese (8.4 to 10.4), nickel (0.4 to 1.0), vanadium (0.27 to 0.31), and zinc (39.1 to 43.2). In addition, sample ELB-95-01C had reportable detects of lead (0.48 ppm), antimony (0.21 ppm), and selenium (0.1 ppm). Sample ELB-95-03C reported detects of lead (0.3 ppm) and selenium (0.13 ppm). Ten composite grasshopper samples from the RSA, EGB-95-01C through EGB-95-10C, inclusive, reported detectable quantities of 10 metals. The metals, and the range of detects in ppm, are as follows: aluminum (38.6 to 71.2), barium (1.5 to 2.4), cadmium (0.11 to 0.79), cobalt (0.08 to 0.15), chromium (0.25 to 0.47), copper (16.8 to 23.2), iron (55.1 to 89.6), manganese (4.7 to 7.9), vanadium (0.08 to 0.14), and zinc (49.5 to 67.9). Mercury was detected in nine samples, EGB-95-01C through EGB-95-08C, inclusive, and EGB-95-10C, with all reported values at 0.01 ppm. Nickel was detected in 8 samples: EGB-95-01C through -04C, EGB-95-06C, and EGB-95-08C through -10C with a range of values from 0.43 to 0.66 ppm. Lead was also detected in eight grasshopper samples: EGB-95-01C, -02C, -04C, and -06C through-10C, with a range from reported values of 0.37 to 0.79 ppm. Selenium was detected in nine samples: EGB-95-01C through -04C and -06C through -10C, with values ranging from 0.11 to 0.23 ppm. Silver was reported in sample EGB-95-01C at 0.1 ppm.

Dioxins/Furans

The compound 1234678-HpCDD was detected in five RSA rabbitbrush samples (EBB-94-10, -12, -13, -14, and -15), ranging from 0.82 to 2.02 ppt. The compound OCDD was detected in the same five samples with values ranging from 2.87 to 10.36 ppt. Also, total HpCDDs were reported in these five samples with values ranging from 0.82 to 3.96 ppt. The compound 1234678-HpCDF was detected in five samples (EBB-94-08, -09, -10, -13, and -15) with values ranging from 0.25 to 1.99 ppt. Two rabbitbrush samples contained 234678-HxCDF: EBB-94-09 at 0.25 ppt and EBB-94-12 at 0.33 ppt. Three samples (EBB-94-10, -13, -14) had detectable quantities of 2378-TCDF, ranging from 0.29 to 0.54 ppt. OCDF was also detected in five samples (EBB-94-08, -09, -10, -12, and -13) with values ranging from 0.54 to 2.63 ppt. Total HpCDFs were reported in five samples (EBB-94-08, -09, -10, -13, and -15) with values ranging from 0.25 to 1.99 ppt. Total HxCDFs were detected in four rabbitbrush samples (EBB-94-09, -10 , -12, and -15), ranging from 0.25 to 5.04 ppt. Total PeCDD was detected in sample EBB-94 -10 at 0.26 ppt and EBB-94-12 at 0.19 ppt. Four samples (EBB-94-08, -12, -14, and -15) had detectable quantities of total PeCDFs, ranging from 0.10 to 0.34 ppt. Total TCDDs were detected in five rabbitbrush samples (EBB-94-08, -09, -10, -14, and -15), ranging from 0.12 to 0.28 ppt. Similarly, total TCDFs were detected in five samples (EBB-94-08, -10, -13, -14, and -15) with values ranging from 0.11 to 1.72 ppt. The compound 123478-HxCDF was detected only in sample EBB-94-10 at a value of 0.72 ppt.

Sweetclover samples at the RSA contained numerous dioxin and furan compounds. Four samples (ECB-94-06, -12, -13, and -13dup) had detectable quantities of 1234678-HpCDD with values ranging from 0.81 to 3.19 ppt. Six samples (ECB-94-06, -13dup, -14, -15, -17, and -19) had detectable quantities of 1234678-HpCDF, ranging from 0.17 to 10.03 ppt. Two samples reported 123478-HxCDF: ECB-94-13dup at 0.18 ppt and ECB-94-15 at 1.34 ppt. Two samples also contained 123678-HxCDD: ECB-94-12 at 0.14 ppt and ECB-94-14 at 0.6 ppt. The compound 123789-HxCDD was detected in the same two samples with values of 0.25 and 0.57 ppt, respectively. The compound 123678-HxCDF was detected in samples ECB-94-14 (0.44 ppt) and ECB-94-15 (0.34 ppt). Ten sweetclover samples (ECB-94-04, -06, -07, -10, -11, -13dup, -14, -15, -17, and -18) had detectable quantities of 234678-HxCDF with values ranging from 0.20 to 0.78 ppt. Two samples had detectable quantities of 23478-PeCDF: ECB-94-13dup at 0.09 ppt and ECB-94-14 at 0.47 ppt. Two samples also had reportable quantities of OCDD: ECB-94-12 at 32.14 ppt and ECB-94-13dup at 6.54 ppt. Seven of the sweetclover samples at the RSA had detectable quantities of OCDF, ranging from 0.39 to 18.9 ppt. Total HpCDDs were detected in eight samples (ECB-94-04, -06, -12, -13, -13dup, -15, -17, and -19) with values ranging from 0.27 to 6.29 ppt. Total HpCDFs were reported in seven samples (ECB-94-06, -12, -13dup, -14, -15, -17, and -19) with values ranging from 0.17 to 10.48 ppt. Four samples (ECB-94-12, -13dup, -14, and -15) had detectable quantities of total HxCDDs, ranging from 0.19 to 1.73 ppt. Eleven sweetclover samples (ECB-94-04, -06, -07, -10, -11, -12, -13dup, -14, -15, -17, and -18) had detectable quantities of total HxCDFs, ranging from 0.20 to 3.57 ppt. Total PeCDFs were reported in seven samples (ECB-94-04, -07, -12, -13dup, -14, -15, and -17) with values ranging from 0.12 to 0.47 ppt. Total TCDDs were detected in six sweetclover samples (ECB-94-07, -12, -13dup, -15, -17, and -19) with values ranging from 0.06 to 0.17 ppt. Eight samples

(ECB-94-04, -07, -12, -13, -13dup, -14, -17, and -19) had detectable quantities of total TCDFs, ranging from 0.19 to 1.09 ppt. Single detects of the following compounds were also reported in sweetclover samples: ECB-94-14 with 123478-HxCDD at 0.56 ppt and 123789-HxCDF at 0.48 ppt, and ECB-94-13dup with 2378-TCDF at 0.21 ppt.

Gumweed sample EMB-94-05 had the following detects: OCDD at 1.59 ppt; OCDF at 0.43 ppt; total HxCDF at 0.29 ppt; and total TCDF at 1.14 ppt. Sample EMB-94-06 had detectable quantities of 2378-TCDF at 0.85 ppt, OCDD at 2.36 ppt, total HpCDD at 0.62 ppt, total TCDDs at 0.18 ppt, and total TCDFs at 1.72 ppt. Gumweed sample EMB-94-11 had the following detects: 12378-PeCDF at 0.12 ppt; 23478-PeCDF at 0.25 ppt; 2378-TCDF at 0.83 ppt; OCDD at 0.74 ppt; total HxCDFs at 0.28 ppt; total PeCDFs at 0.74 ppt; and total TCDFs at 1.49 ppt. Sample EMB-94-15 had a detectable quantity reported for total HpCDDs of 0.80 ppt.

Jackrabbit sample EJB-94-13 at the RSA had detectable quantities of 0.05 ppt for 1234678-HpCDF, 0.19 ppt for OCDD, and 0.05 ppt for total HpCDFs. Sample EJB-94-08 had a single reportable detect for total HxCDFs at 0.19 ppt. Sample EJB-94-15 had detectable quantities of total PeCDFs (0.21 ppt) and total TCDFs (0.76 ppt).

TCDD detects are reported for three beetle samples from the RSA: ELB-95-01C (1.48 ppt), ELB-95-02C (1.07 ppt), and ELB-95 -03C (50.04 ppt). Total HxCDF was reported in seven grasshopper samples—EGB-95-01C, EGB-95-03C through -07C, and EGB-95-10C—with values ranging from 0.25 to 0.35 ppt. Sample EGB-95-10C also reported 0.86 ppt of TCDD.

Explosives

Five rabbitbrush samples (EBB-94-04, -12, -13, -14, and -15) had detectable quantities of 2,4,6-TNT, with values ranging from 8,700 to 30,000 ppb. A value of 270 ppb of 2,4,6-TNT was reported for one sweetclover sample, ECB-94-04. Two sweetclover samples (ECB-94-18 and -19) had detects of RDX of 420 and 1,700 ppb, respectively.

Grasshopper/beetle samples were not analyzed for explosives.

Herbicides

Sweetclover sample ECB-94-10 analysis reported a 2,4-D value of 14,000 ppb.

Grasshopper/beetle samples were not analyzed for herbicides.

Pesticides

A total of 4 (EBB-94-03, -09, -12, and -13) of the 15 rabbitbrush samples had detectable quantities of 4,4'-DDE; the values ranged from 91 to 130 ppb. Also, 1 (EJB-94-11) analysis from the 16 jackrabbit samples reported this pesticide compound at a level of 2.5 ppb.

Three beetle samples, ELB-95-01C, -02C, and -03C, had detectable quantities of 4,4'-DDE ranging from 2.0 to 5.5 ppb. Three grasshopper samples from the RSA, EGB-95-02C, -05C, and -08C, had detects of 4,4'-DDT with values ranging from 0.61 to 0.72 ppb. All grasshopper/beetle pesticide detects were identified with a "J" qualifier.

PAHs

PAHs were detected in all 15 rabbitbrush samples taken from the RSA. Pyrene was detected in 13 of the 15 (pyrene was not detected in samples EBB-94-07 and -12) with a range of values from 0.4 to 1.1 ppb. Similarly, fluoranthene was detected in 13 of 15 rabbitbrush samples (samples EBB-94-01 and -11 did not contain fluoranthene) with a range of 1.3 to 2.9 ppb. Phenanthrene was reported in 10 samples (not reported in EBB-94-01 -,02, -03, -09, and -11). The values for phenanthrene ranged from 3.8 ppb to 14 ppb. A single detect of chrysene (0.89 ppb) was reported for sample EBB-94-08.

PAHs were detected in 12 of the 15 sweetclover samples collected from the RSA. There were 12 detects of phenanthrene (samples ECB-94-04, -07, and -09 did not contain phenanthrene) with a range of values from 1.8 to 5.1 ppb. Eleven sweetclover samples had detections of pyrene (samples ECB-94-04, -07, -08, and -09 did not have pyrene detections) with a range of 0.28 to 0.58 ppb. Ten samples contained fluoranthene (samples ECB-94-04, -06, -07, -09, and -10 did not contain fluoranthene) with values ranging from 0.69 ppb to 1.4 ppb. A single detect of chrysene (0.64 ppb) was found in sweetclover sample ECB-94-10.

Four of seven gumweed samples (EMB-94-11, -12, -15, and -18) had detections of phenanthrene. The values ranged from 3.9 to 12 ppb.

There were no detections of PAHs in RSA jackrabbit samples.

Grasshopper/beetle samples were not analyzed for PAHs.

5.11 MEAN CONCENTRATIONS OF ANALYTES IN SOIL RELATIVE TO MEAN CONCENTRATIONS OF ANALYTES IN BIOTA

One objective of the soil collection was to determine if a correlation existed between known contaminated soil and the vegetation, jackrabbits, and terrestrial invertebrates (grasshoppers, beetles) growing on, growing around, or living in the contaminated soil area. This correlation might include qualitative observation of stressed vegetation or lack of vegetation, or quantitative analysis of biouptake of some contaminants into the vegetation or fauna as determined by chemical analysis. In order to evaluate this possibility, the mean soil concentrations of those COPCs, which were also analyzed in biota, were plotted against the mean concentrations of the COPCs in biota on a SWMU basis as well as on an ESA basis. Herbicides were not analyzed in the co-located soil samples since 2-4 dichlorophenoxyacetic acid (2,4-D) was the only herbicide determined to be a COPC on a TEAD site-wide basis.

This compound was detected as a COPC on a SWMU basis only (Final COPC list by SWMU) in SWMU 34 (Pesticide/Herbicide Storage Building).

Due to time constraints and the ver, large number of data records, it was not possible to evaluate each vegetation sample, its co-located soil, and the jackrabbit data on a specific location basis.

In order to illustrate relative concentrations for the various matrices, mean concentrations were calculated using parametric statistics with no assumption as to the underlying distribution. Non-detects were set at one-half the CRL or MDL for soil and biota, respectively. Therefore, the graphs may show detections when, in fact, no detections occurred. This is best seen on the graphs where many of the bars are of the same height for the same matrix.

Graphs of mean soil, plants, and jackrabbit concentrations were plotted for many but not all of the COPCs.

5.11.1 Mean Concentration of Metals in Soil Relative to Mean Concentrations of Metals in Biota

Aluminum

SWMU Basis

The mean soil, plants, jackrabbit, and invertebrate aluminum concentrations are depicted in Figure 5-10. Gumweed often has the highest tissue concentrations reported. SWMU 42, SWMU 45, and the RSA show a high degree of similarity for aluminum in vegetation. Aluminum in soil varies widely between locations, ranging from approximately 2,000 to 12,000 ppm; the RSA concentration falls in the mid-range. Aluminum concentration in invertebrates is highest in the RSA samples, slightly greater than SWMUs 1b/1c.

ESA Basis

Aluminum concentrations on an ESA basis are shown in Figure 5-11. Although averaged soil concentrations are nearly equal for ESA-1 and the RSA, ESA-1 biota concentrations are generally lower than those in the RSA. ESA-2 values for gumweed are notably higher than either the RSA or ESA-1, corresponding to higher soil values at ESA-2, although rabbitbrush concentrations for ESA-2 are less than that at the RSA.

Antimony

SWMU Basis

Concentrations of antimony in biota at TEAD SWMUs appear similar to those at the RSA except for gumweed and rabbitbrush at SWMU 21. The highest soil concentration of antimony is at SWMU 42 (Figure 5-12). Antimony was not detected in soils at the RSA.

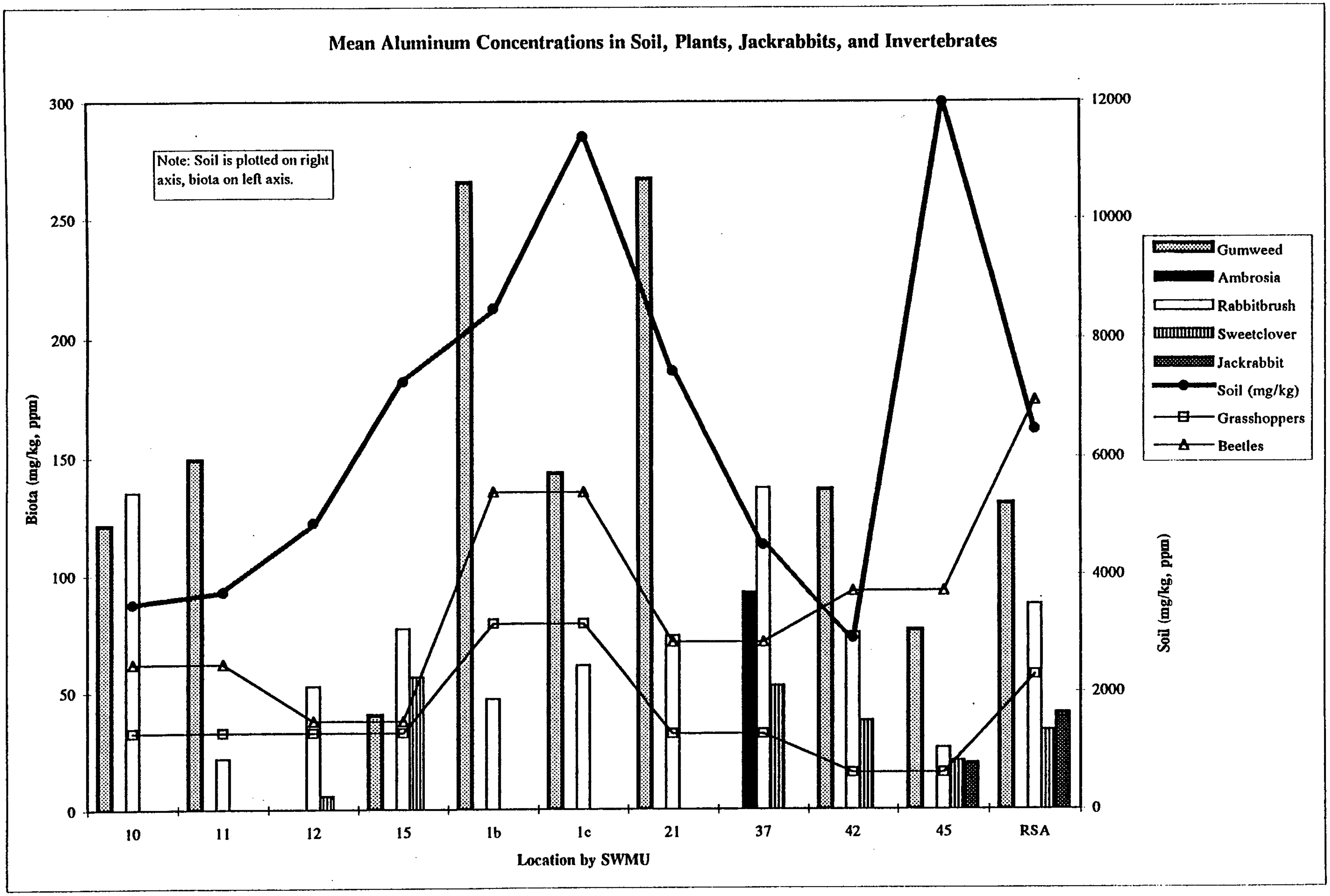

Figure 5-10. Mean Aluminum Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

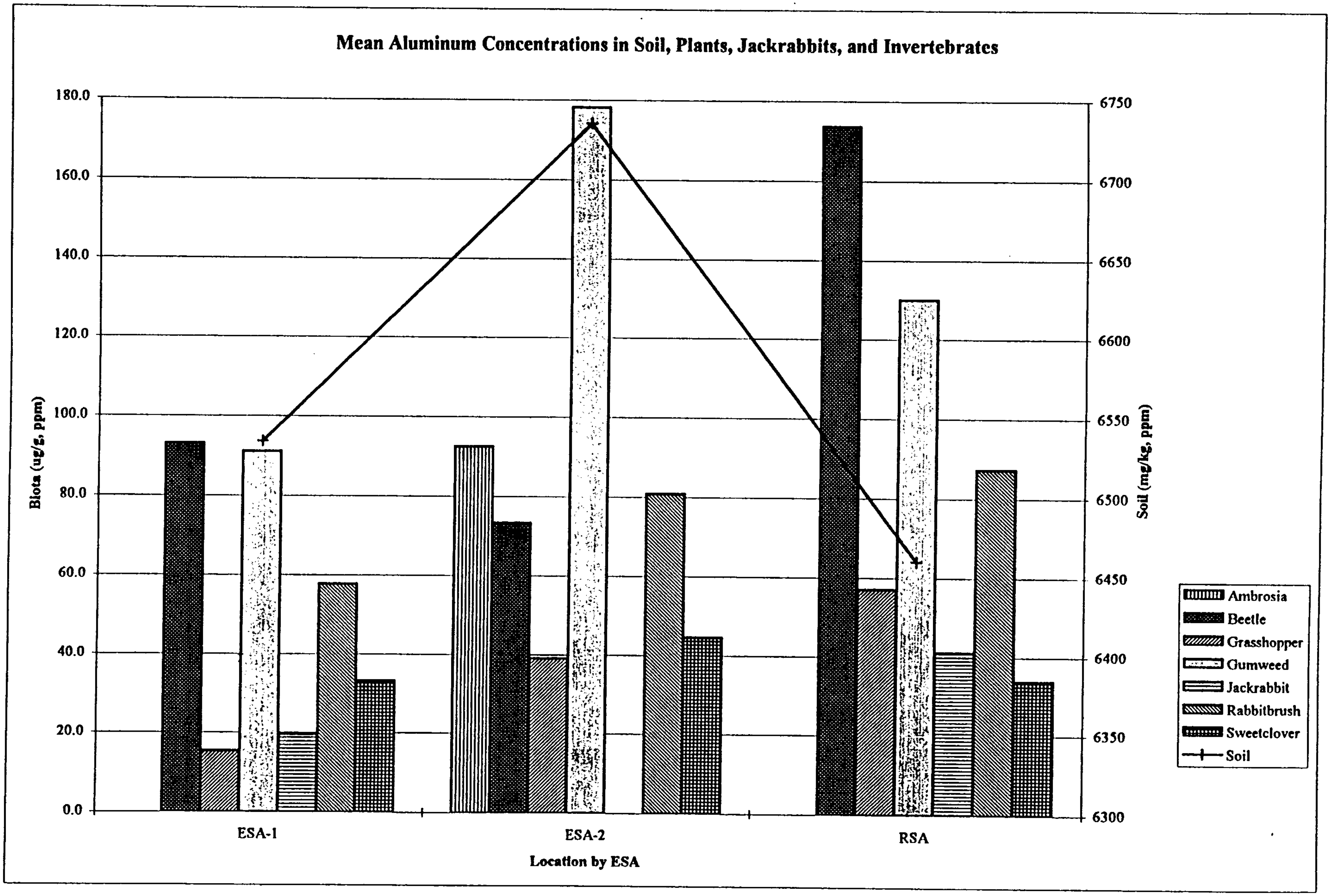

Figure 5-11. Mean Aluminum Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

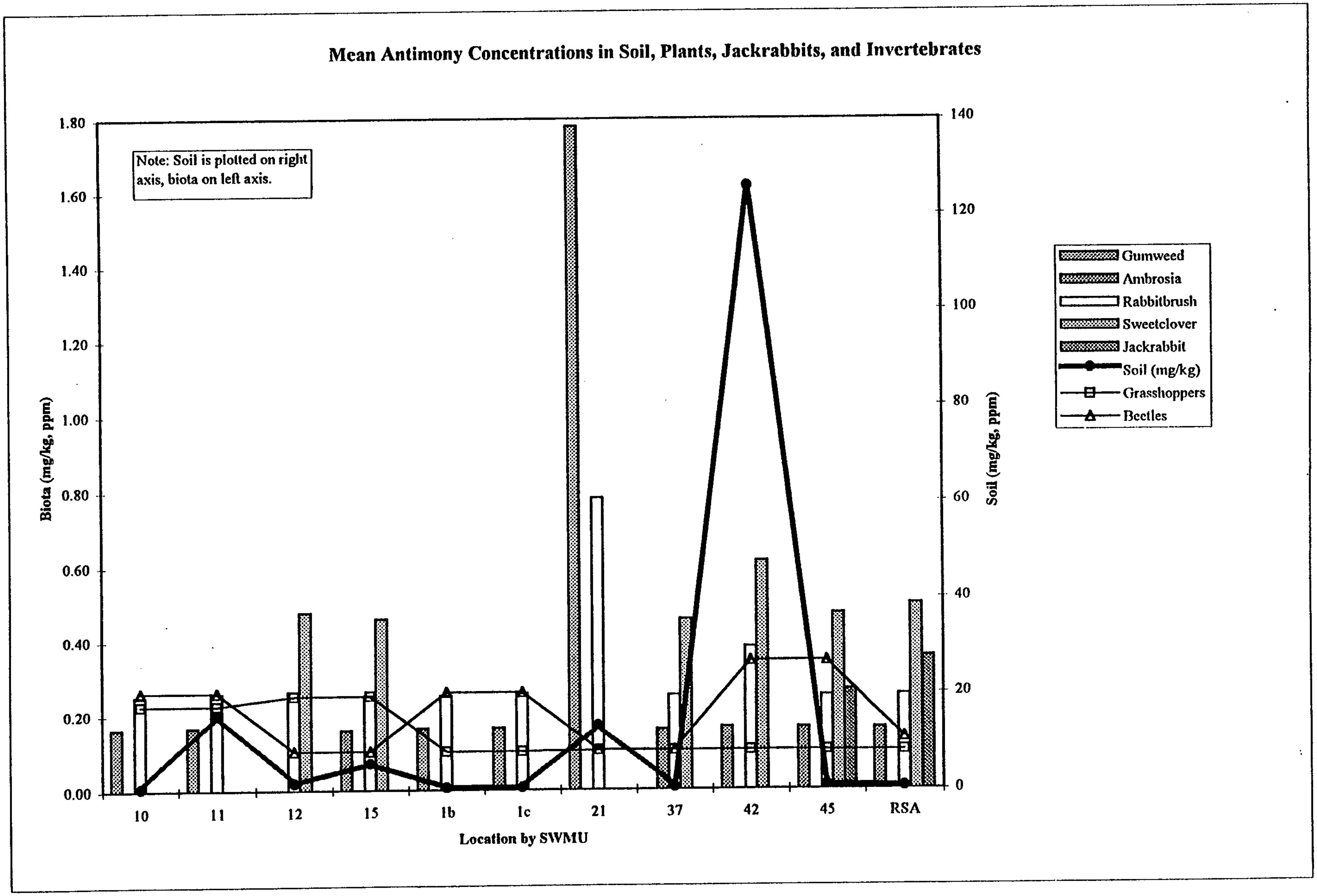

Figure 5-12. Mean Antimony Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

ESA Basis

Although antimony was not detected in RSA soils as noted above, distribution of antimony in biota as shown in Figure 5-13 is very similar between the two ESAs and the RSA.

Arsenic

SWMU Basis

Mean arsenic concentrations in soil, plants, jackrabbits, and beetles vary by approximately an order of magnitude (Figure 5-14). Mean arsenic is highest at SWMUs 15, 1c, and 42. However, SWMU 15 had some of the lowest bioaccumulation factors (BAFs) for arsenic.

ESA Basis

As seen in Figure 5-15, there is correlation between arsenic soil concentrations and most biota concentrations. Jackrabbit concentrations at ESA-1 are slightly less than those at the RSA

Barium

SWMU Basis

Barium soil concentrations were considerably higher than biota concentrations, which is to be expected; however, barium in sweetclover at SWMU 42 approached soil concentrations. As expected, barium BAFs were highest for sweetclover (see Appendix I, Barium BAF). Except for SWMUs 21 and 42, barium at TEAD is similar to the RSA (Figure 5-16).

ESA Basis

Most biota concentrations are similar between the two ESAs and the RSA although soil values vary as noted in Figure 5-17. The notable exception is sweetclover at ESA-1 which correlates with the elevated concentration of barium in this area.

Cadmium

SWMU Basis

The highest cadmium concentrations in biota occurred in gumweed at SWMU 15, where soil concentrations were low, and at SWMU 21, where soil concentrations were high. With the exceptions of SWMUs 15 and 21, the TEAD SWMUs show similarity to the RSA (Figure 5-18).

ESA Basis

Little correlation is seen between cadmium soil and biota values. ESA-1, which shows the highest soil concentration (Figure 5-19), has biota values comparable to ESA-2 and the RSA, with the exception of gumweed as noted above.

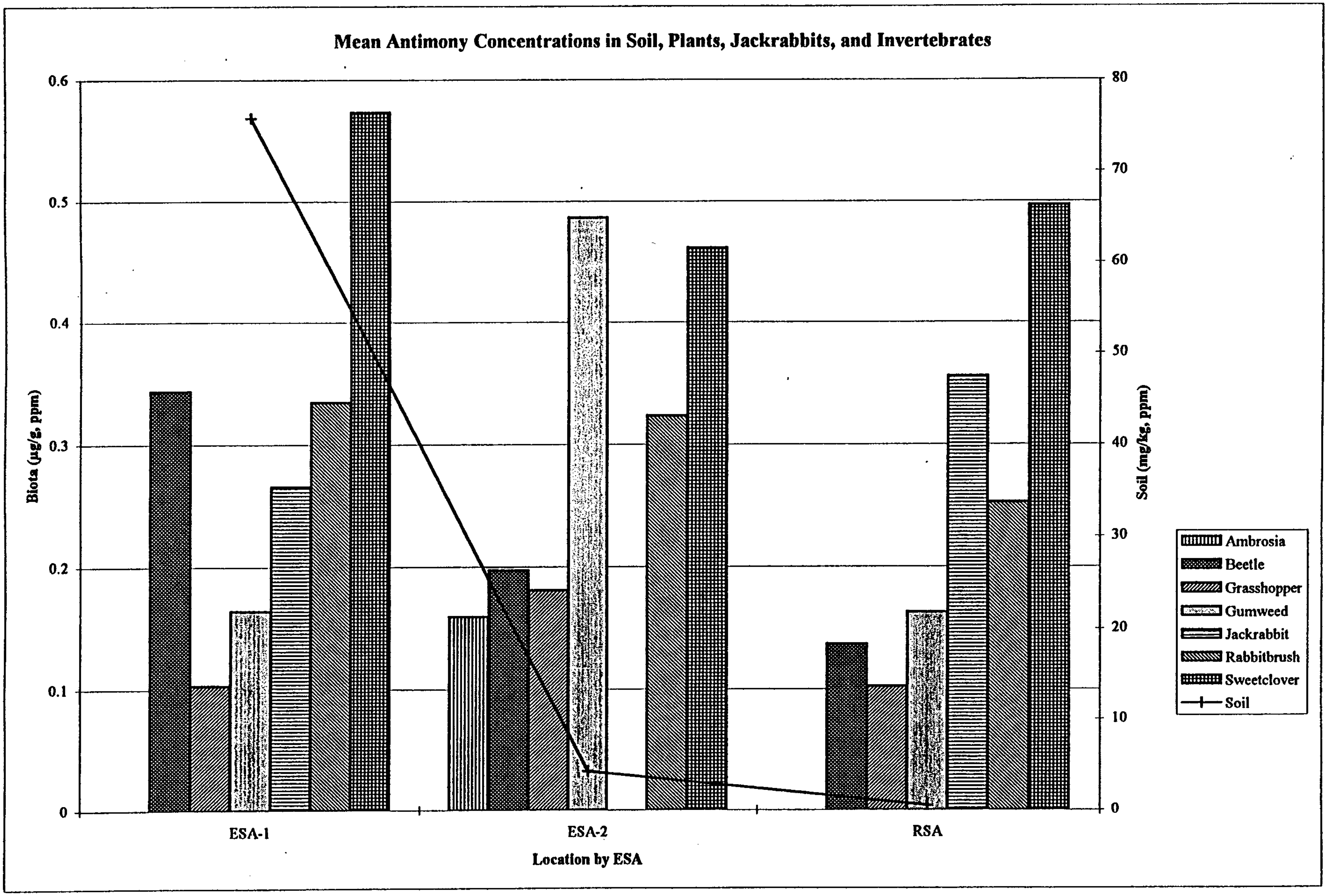

Figure 5-13. Mean Antimony Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

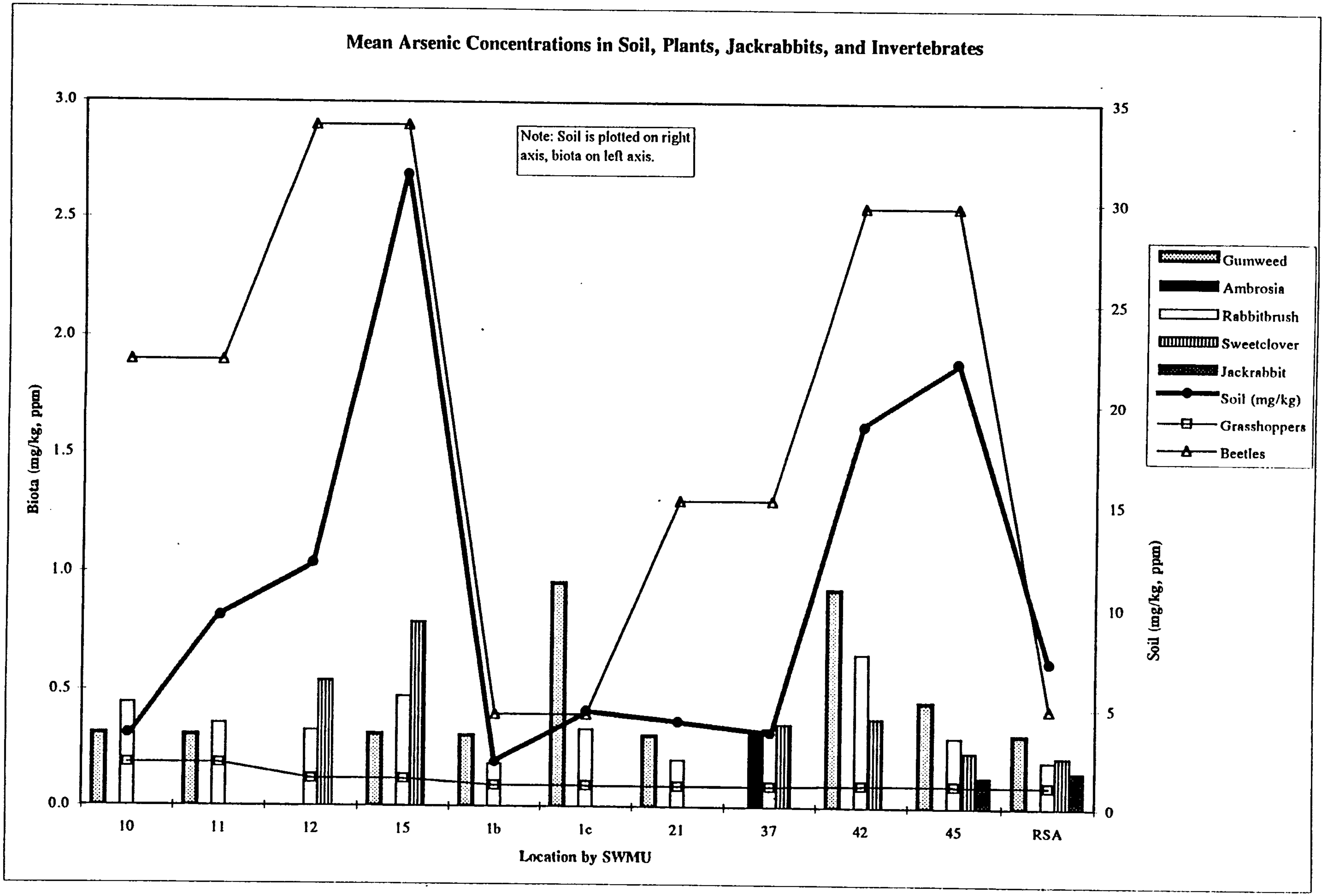

Figure 5-14. Mean Arsenic Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

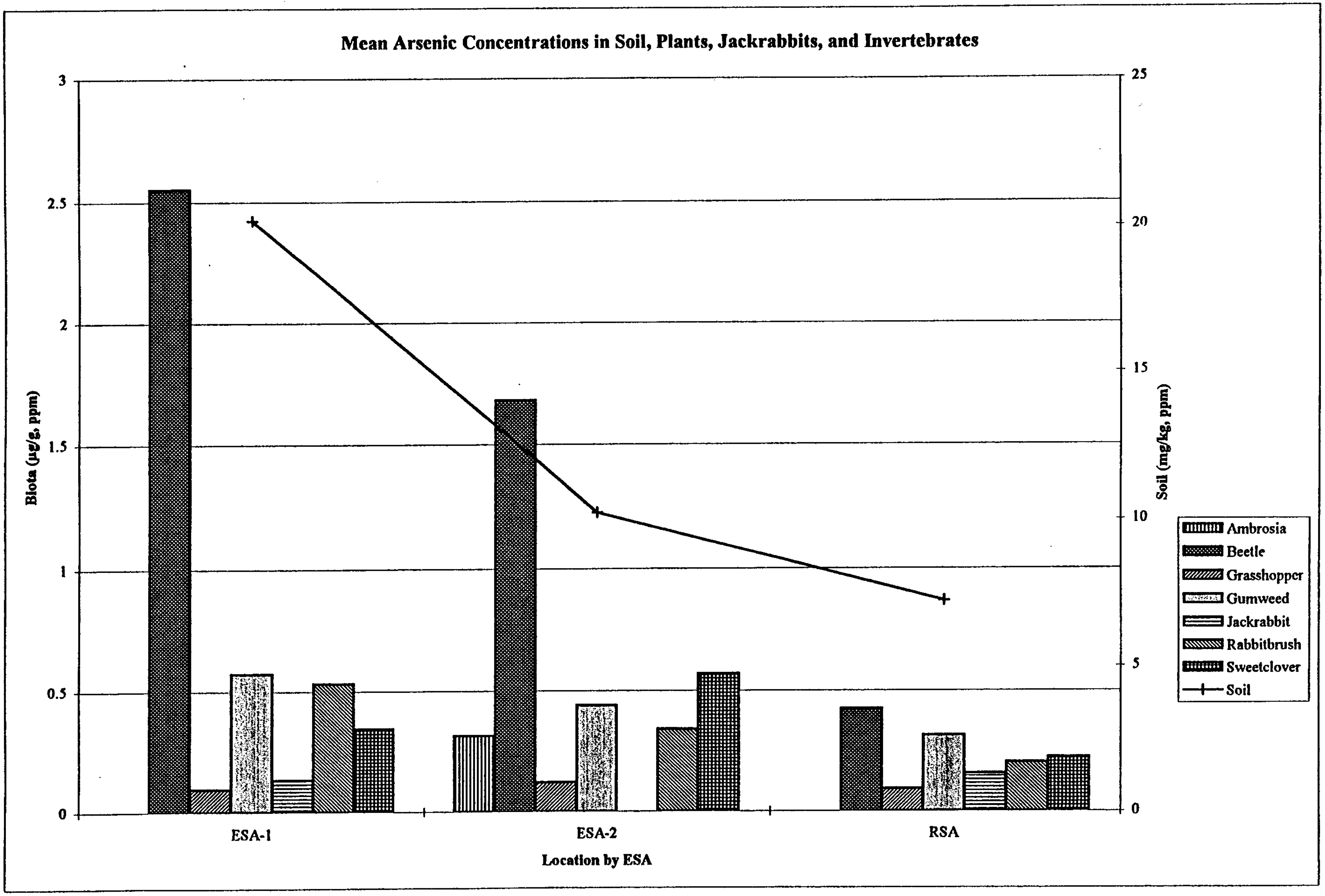

Figure 5-15. Mean Arsenic Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

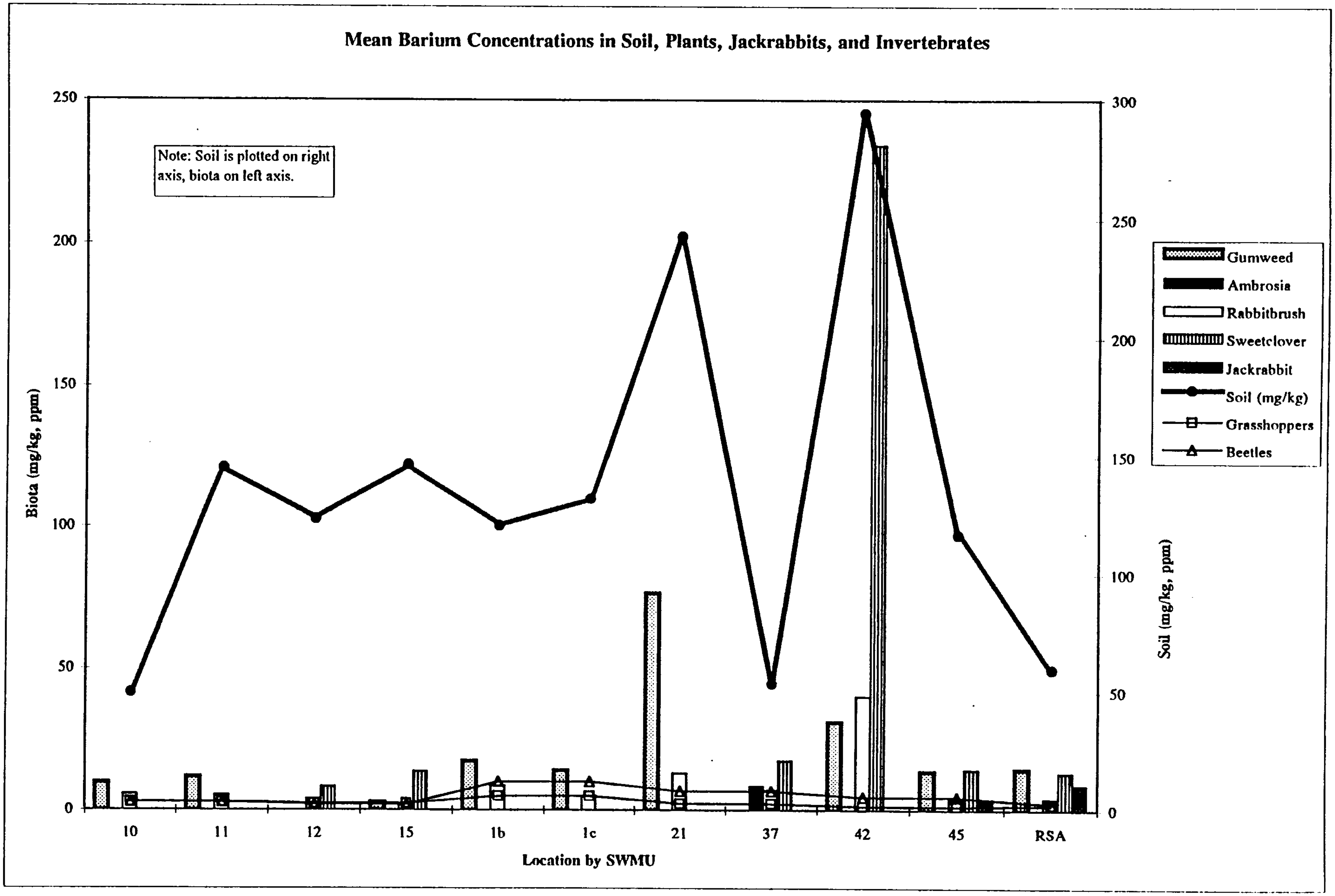

Figure 5-16. Mean Barium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

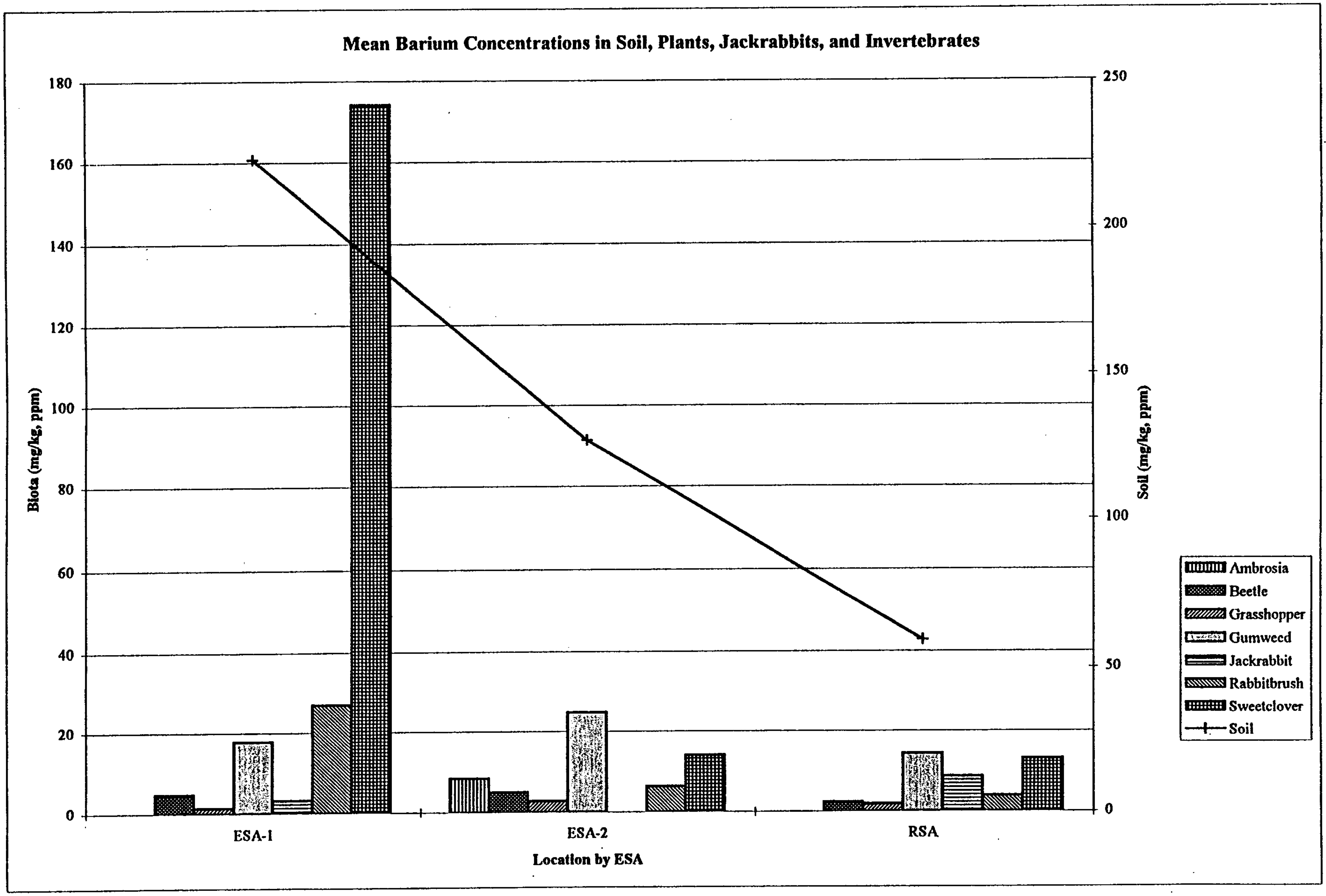

Figure 5-17. Mean Barium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

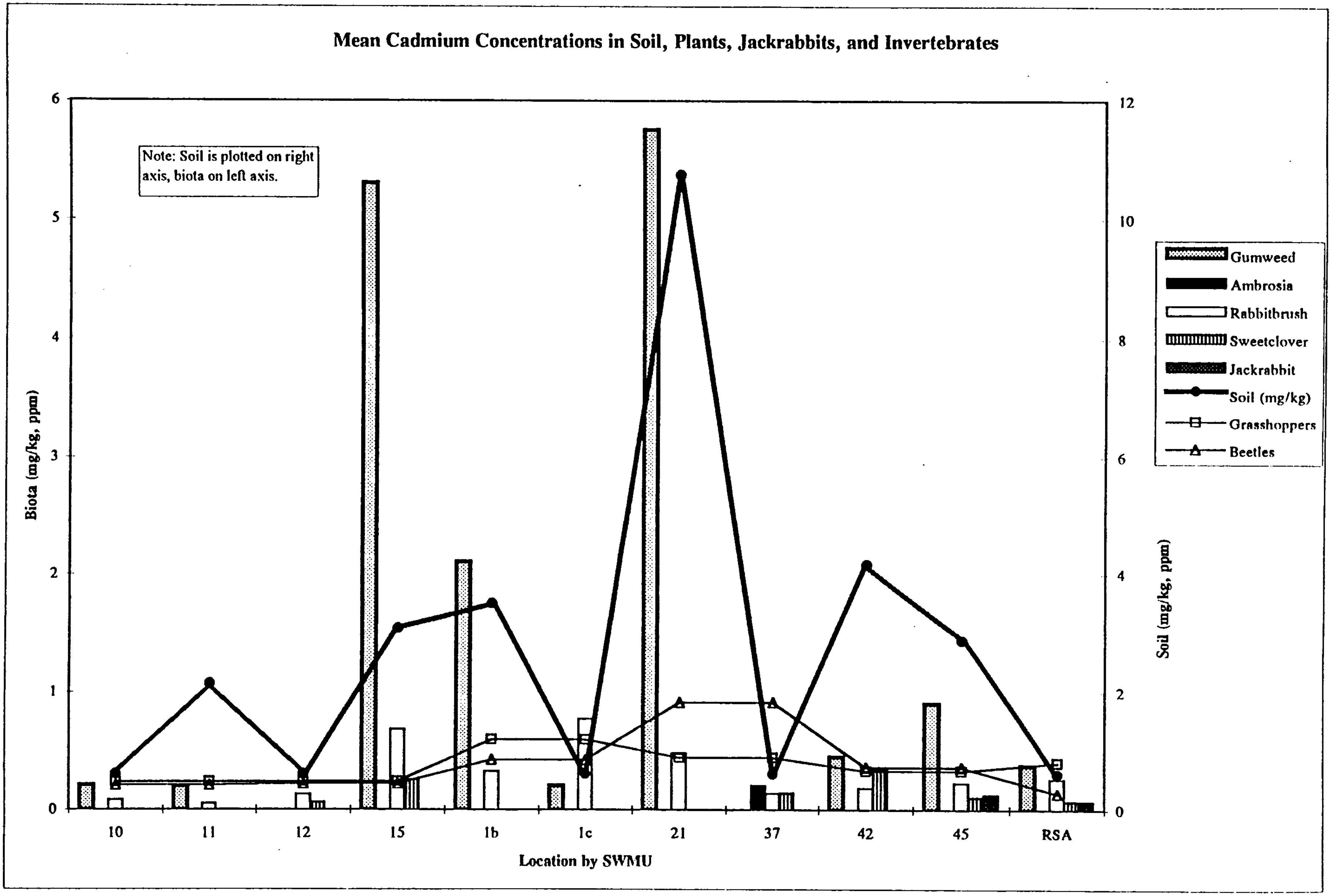

Figure 5-18. Mean Cadmium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

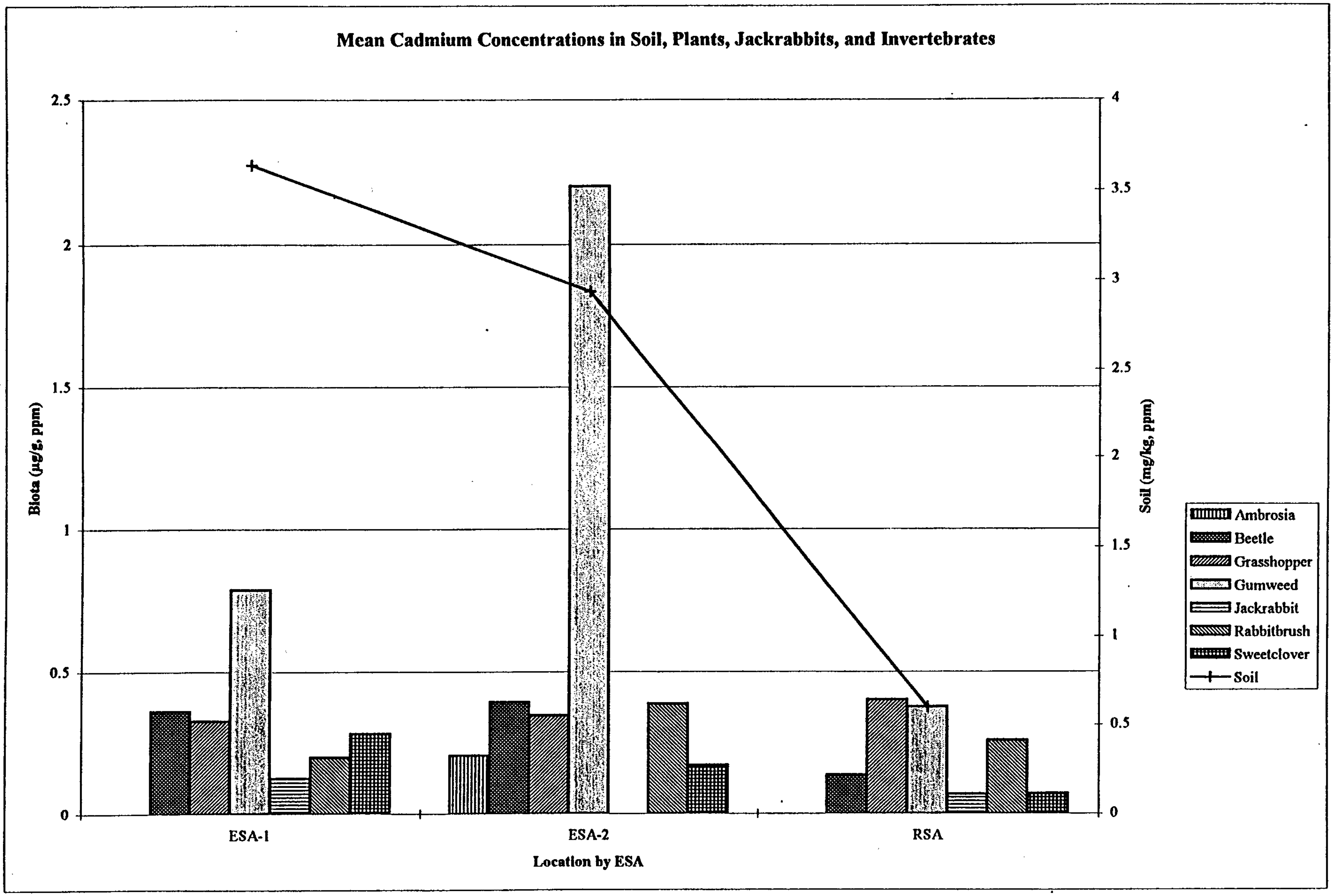

Figure 5-19. Mean Cadmium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

Chromium

SWMU Basis

Chromium in biota appeared very similar between the TEAD SWMUs and the RSA with the exception of chromium in gumweed at SWMU 21. Soil concentrations range between approximately 7 to 35 ppm (Figure 5-20).

ESA Basis

Although soil concentrations vary by a factor of two as seen in Figure 5-21, there is little difference between biota concentrations in the three areas. Sweetclover shows the best correlation to soil concentrations.

Cobalt

SWMU Basis

Mean cobalt concentrations in biota, except for cobalt in sweetclover at SWMU 42, are fairly consistent between TEAD SWMUs and the RSA. Soil concentrations are typically low but rather sporadic between SWMUs (Figure 5-22).

ESA Basis

There is some correlation between concentrations of cobalt in soil and beetles as shown in Figure 5-23. Although soil concentrations are nearly the same in ESA-1 and the RSA, sweetclover values vary by a factor of four.

Copper

SWMU Basis

Copper concentrations in biota and soil differed by up to two orders of magnitude. With the exception of copper in soil at SWMU 15 and copper in gumweed at SWMU 21, the TEAD and RSA look similar (Figure 5-24). Copper in grasshoppers is consistently higher than that in beetles, which is different from most metal analytes.

ESA Basis

Although copper concentrations in ESA-2 soil are 5 to 10 times higher than that in the RSA and ESA-1, only the concentration of copper in grasshopper tissue showed a corresponding increase (Figure 5-25). All other biota values were comparable between areas.

Iron

SWMU Basis

SWMUs 1b, 1c, and 21 show similarity in both soil and biota iron concentrations. SWMU 45 and the RSA are very similar for soil and biota tissues except insects (RSA mean values are approximately twice SWMU 45 values). Gumweed iron concentrations are consistently high between SWMUs and at the RSA (Figure 5-26).

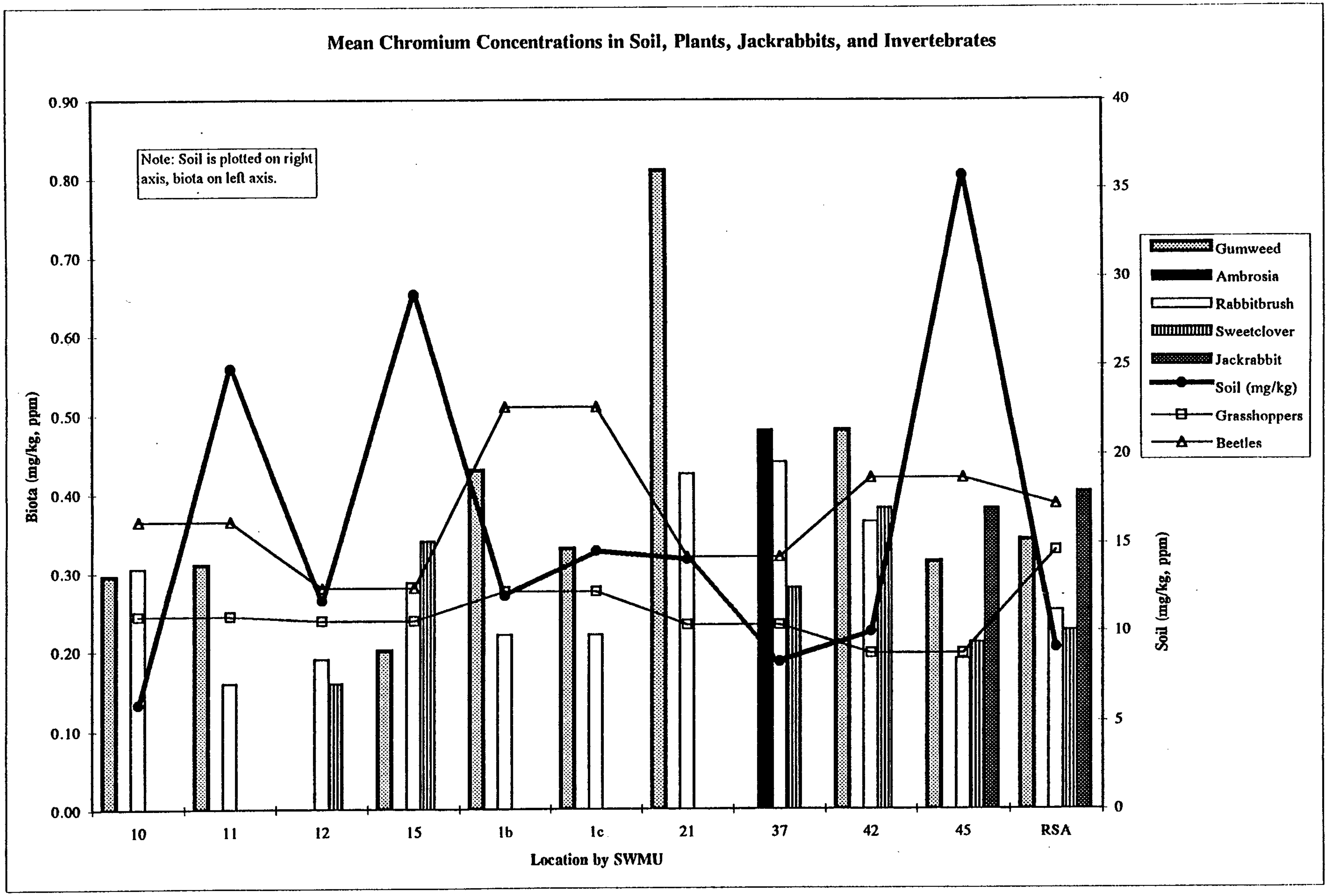

Figure 5-20. Mean Chromium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

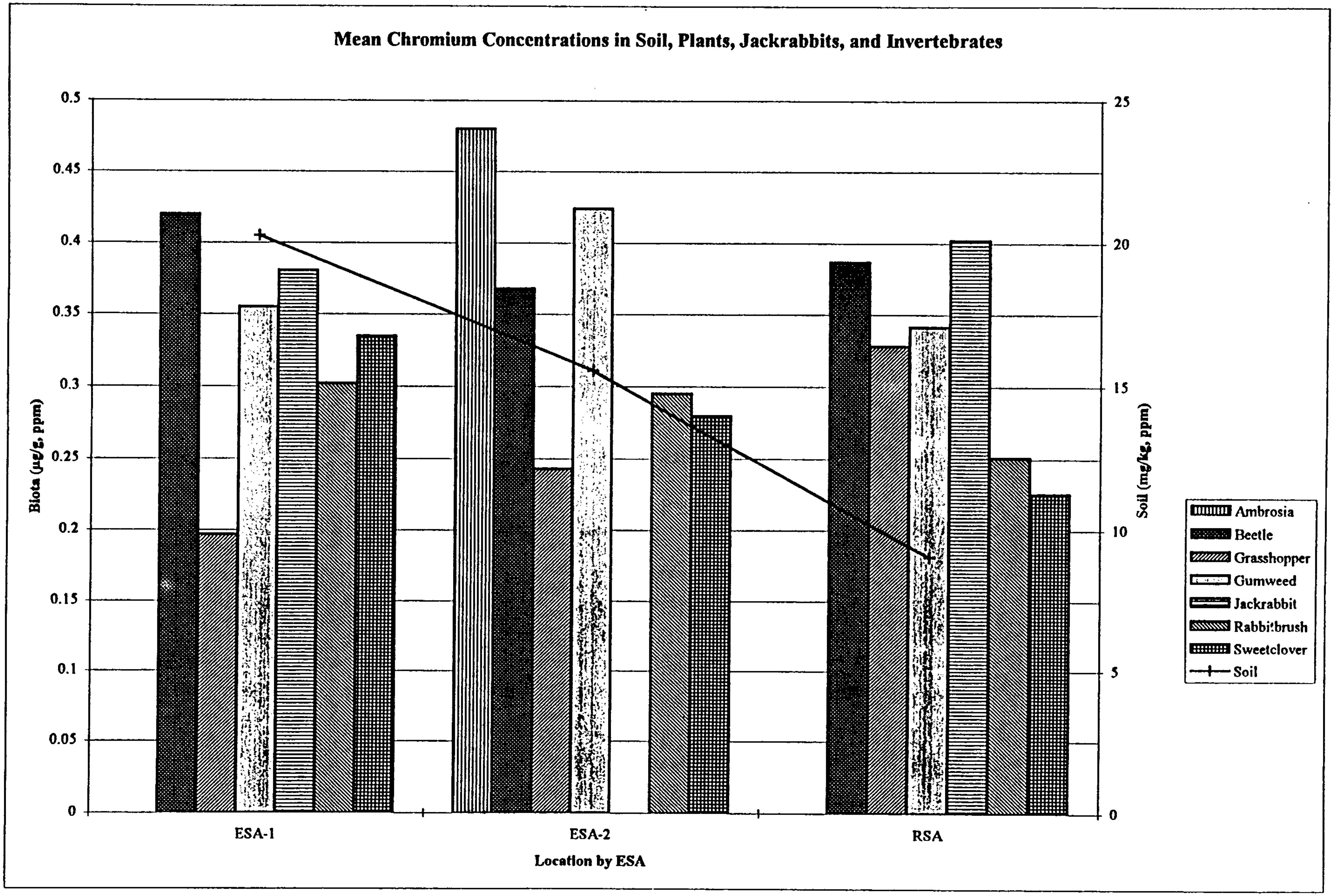

Figure 5-21. Mean Chromium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

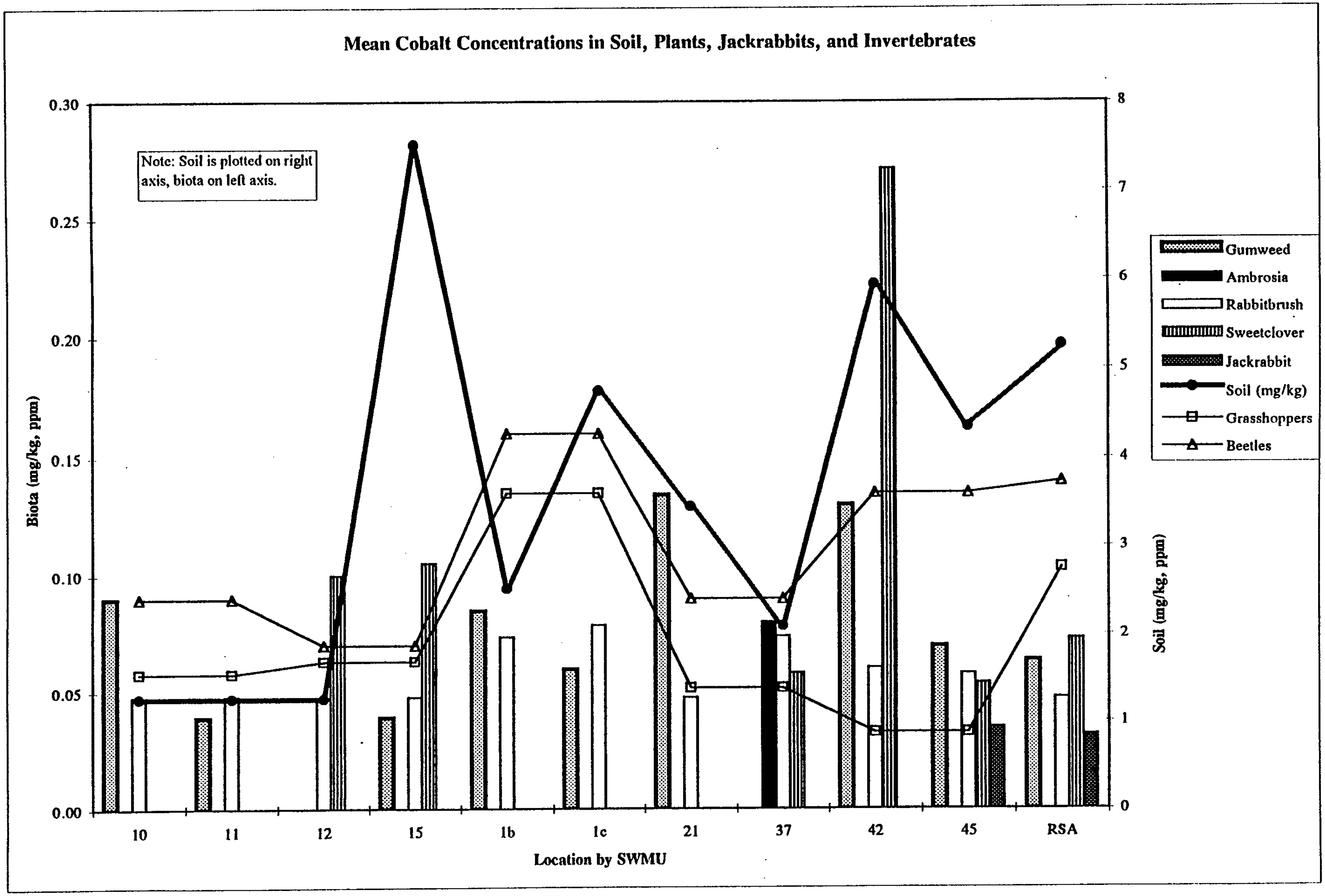

Figure 5-22. Mean Cobalt Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

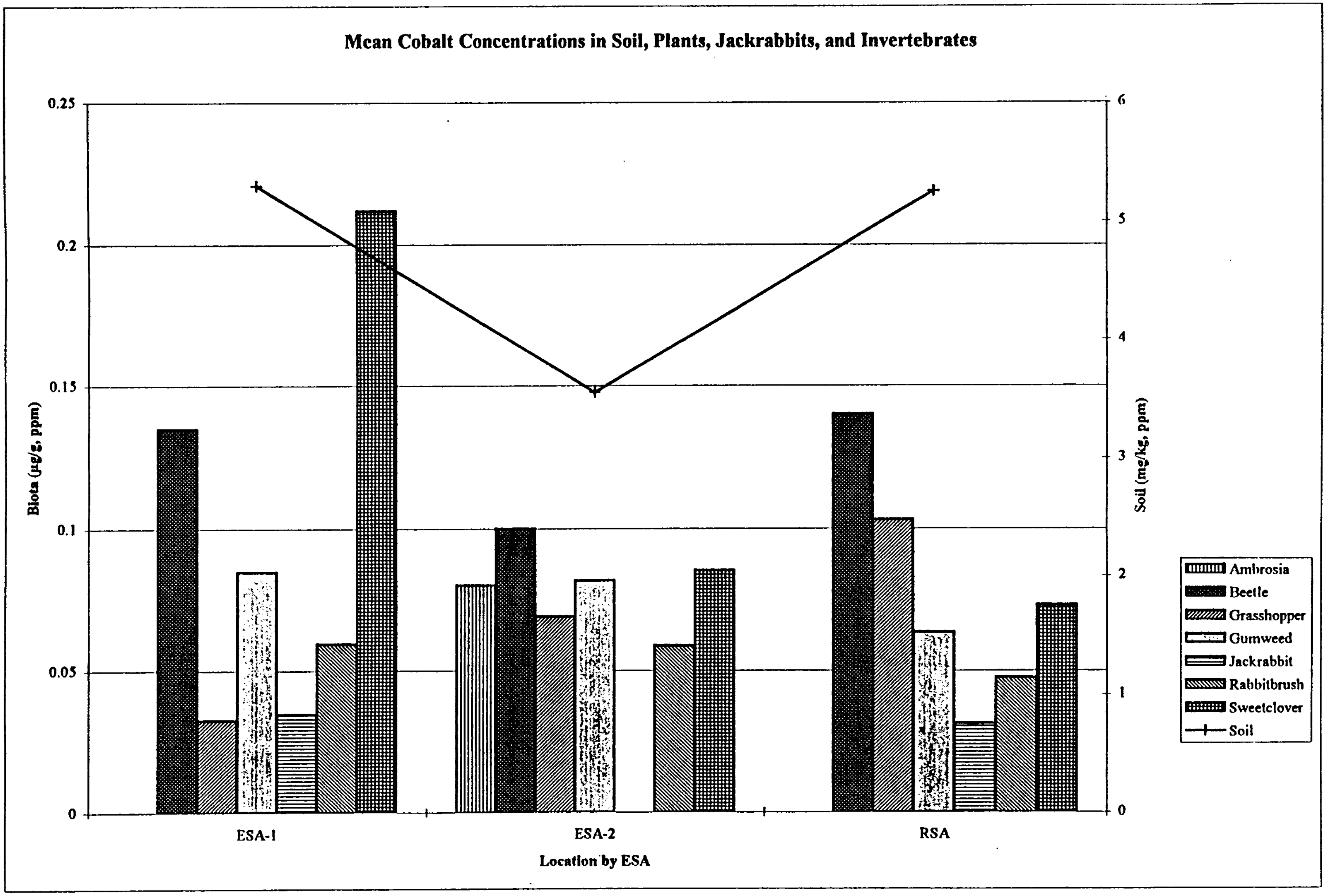

Figure 5-23. Mean Cobalt Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

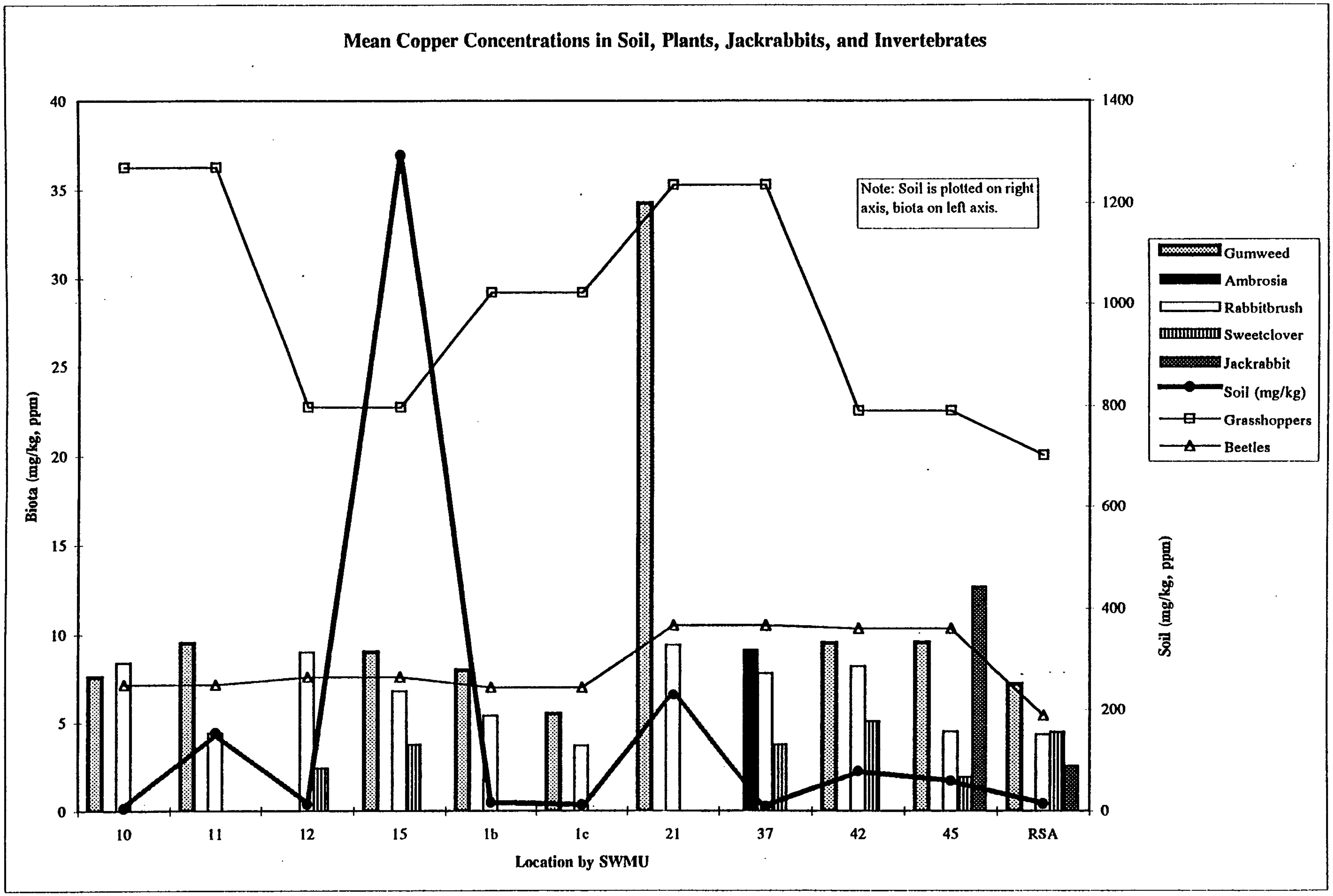

Figure 5-24. Mean Copper Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

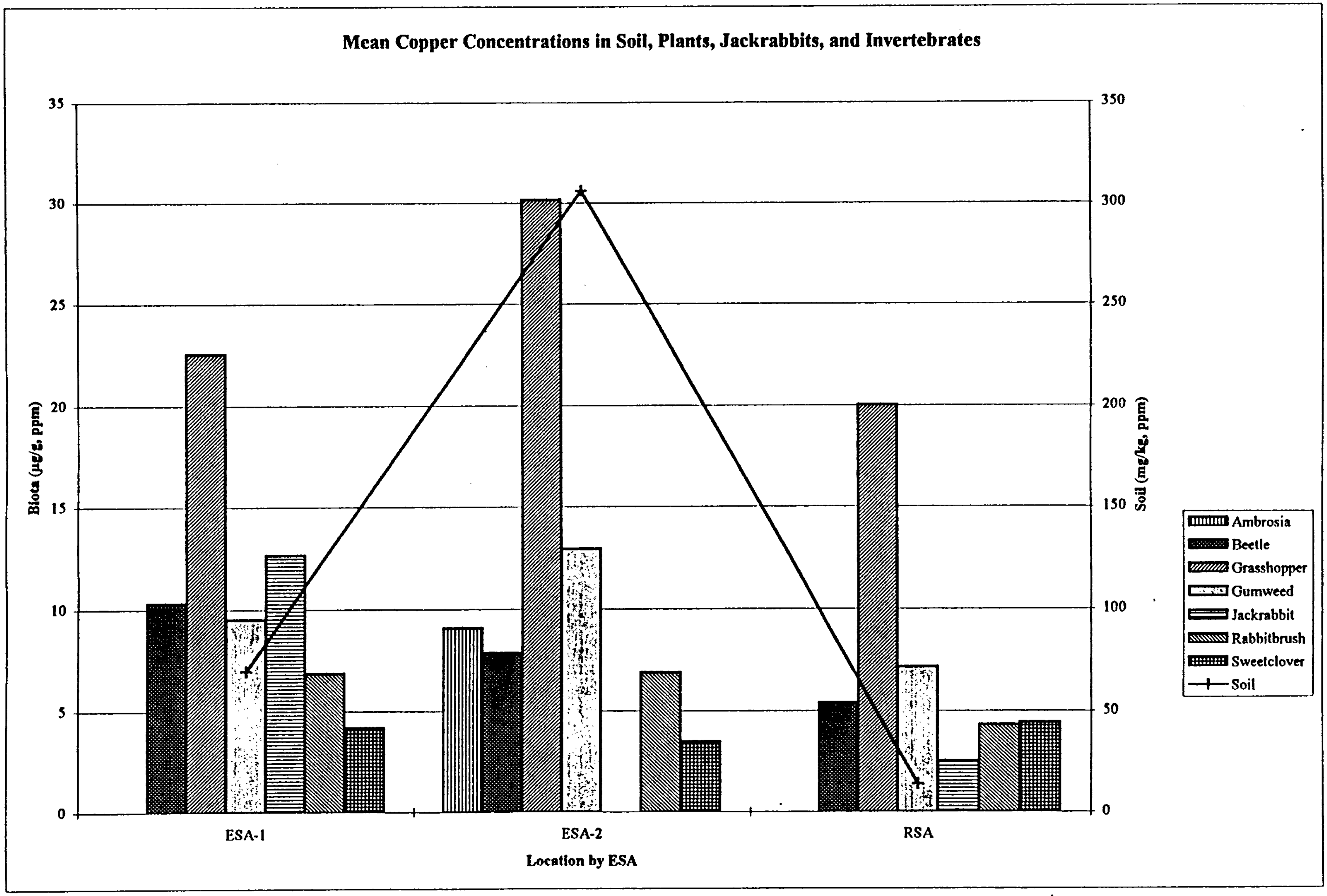

Figure 5-25. Mean Copper Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

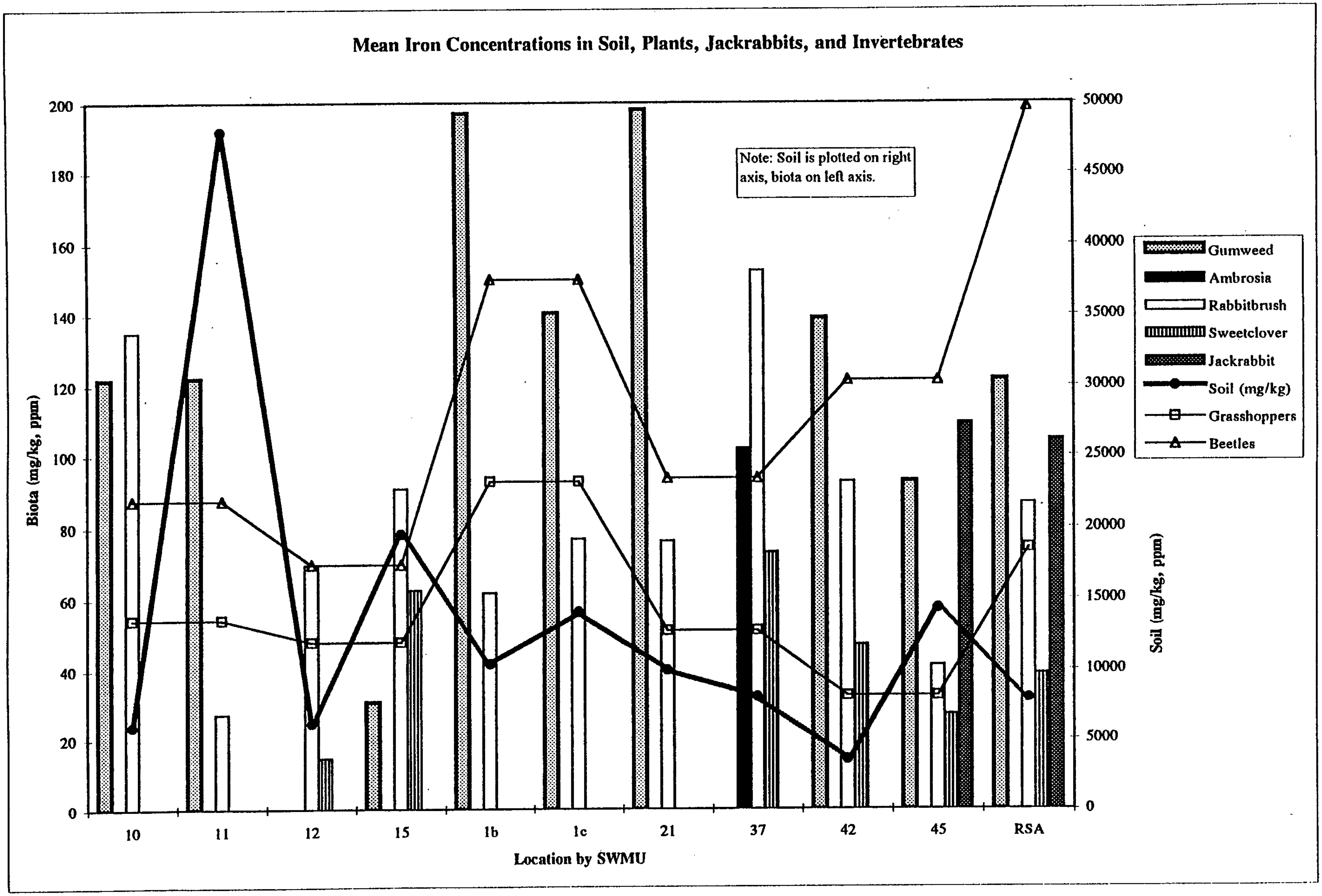

Figure 5-26. Mean Iron Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

ESA Basis
As can be seen in Figure 5-27, iron concentrations in soil at ESA-2 are twice that of both ESA-1 and the RSA. Only gumweed shows a similar, although smaller trend. Conversely, the concentration of iron in RSA beetle tissue is twice that of ESA-2.

Mercury

SWMU Basis
Mean mercury concentrations were constant due to few detections in biota. Other than at SWMU 15, mercury in soil is low, or with few detections. SWMU 42, SWMU 45, and the RSA appear similar (Figure 5-28), except beetle concentrations, which are higher in SWMUs 42 and 45.

ESA Basis
Concentrations of mercury in beetle tissue show a correspondence with soil concentrations for all three areas. Other biota values are nearly identical across the three areas despite a threefold difference in soil concentrations (Figure 5-29).

Manganese

SWMU Basis
Mean manganese concentrations in biota remain fairly consistent between the TEAD SWMUs and the RSA. Rabbitbrush tends to have the consistently higher manganese concentrations. Soil concentrations range between approximately 80 and 325 ppm (Figure 5-30).

ESA Basis
As noted above, manganese concentrations are consistent between the three areas when calculated on an ESA basis. Although soil concentrations are lowest in the RSA, manganese concentrations in gumweed and rabbitbrush are highest at that area (Figure 5-31).

Nickel

SWMU Basis
Nickel in biota appears consistent between the TEAD SWMUs and the RSA with the exception of ambrosia and rabbitbrush at SWMU 37. SWMU 11 nickel concentrations in soil are higher than the other SWMUs and the RSA (Figure 5-32).

ESA Basis
All concentrations of nickel in biota calculated on an ESA basis are comparable between areas as shown on Figure 5-33. The single ambrosia reading at SWMU 37 shows a significantly higher nickel value than other plants.

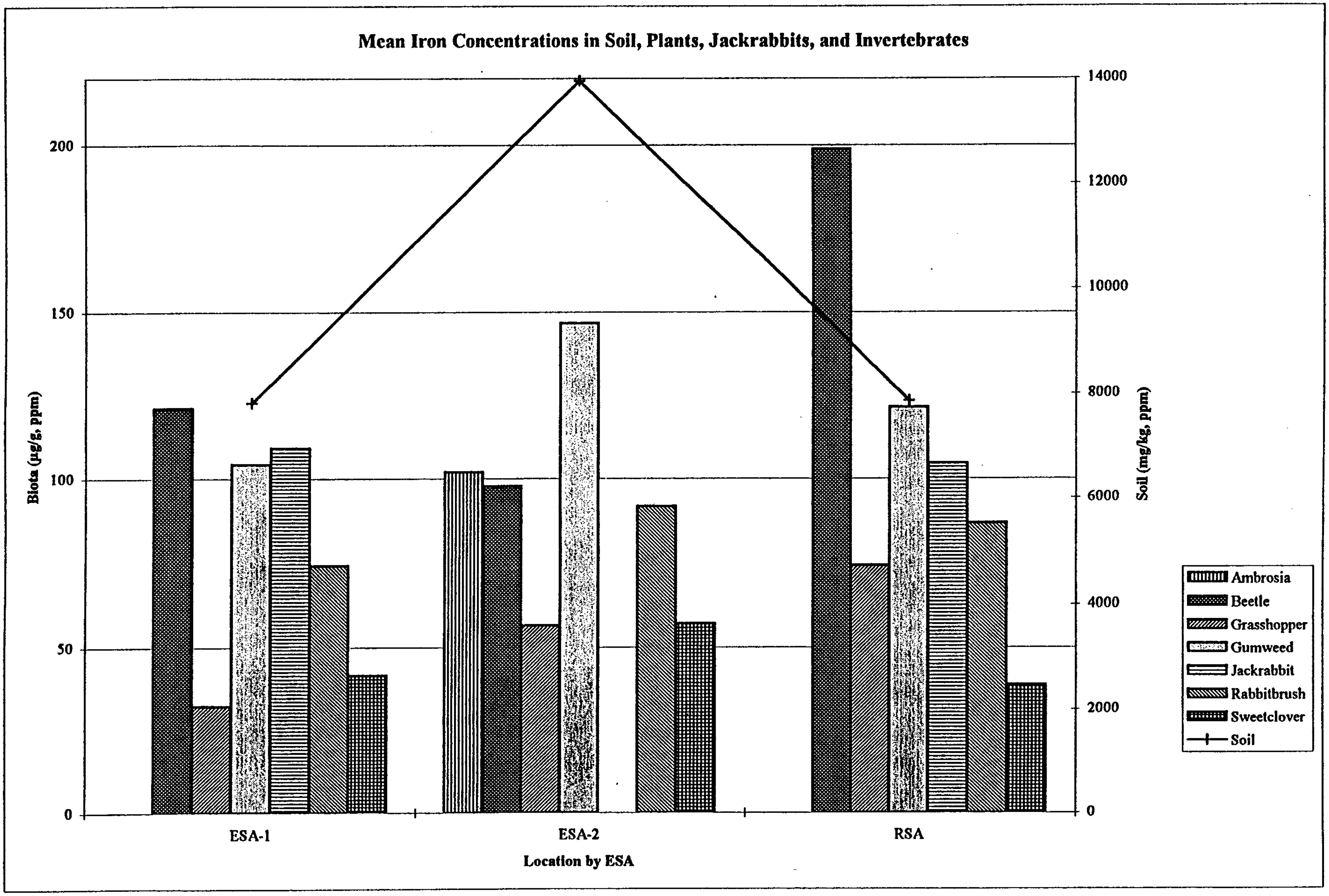

Figure 5-27. Mean Iron Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

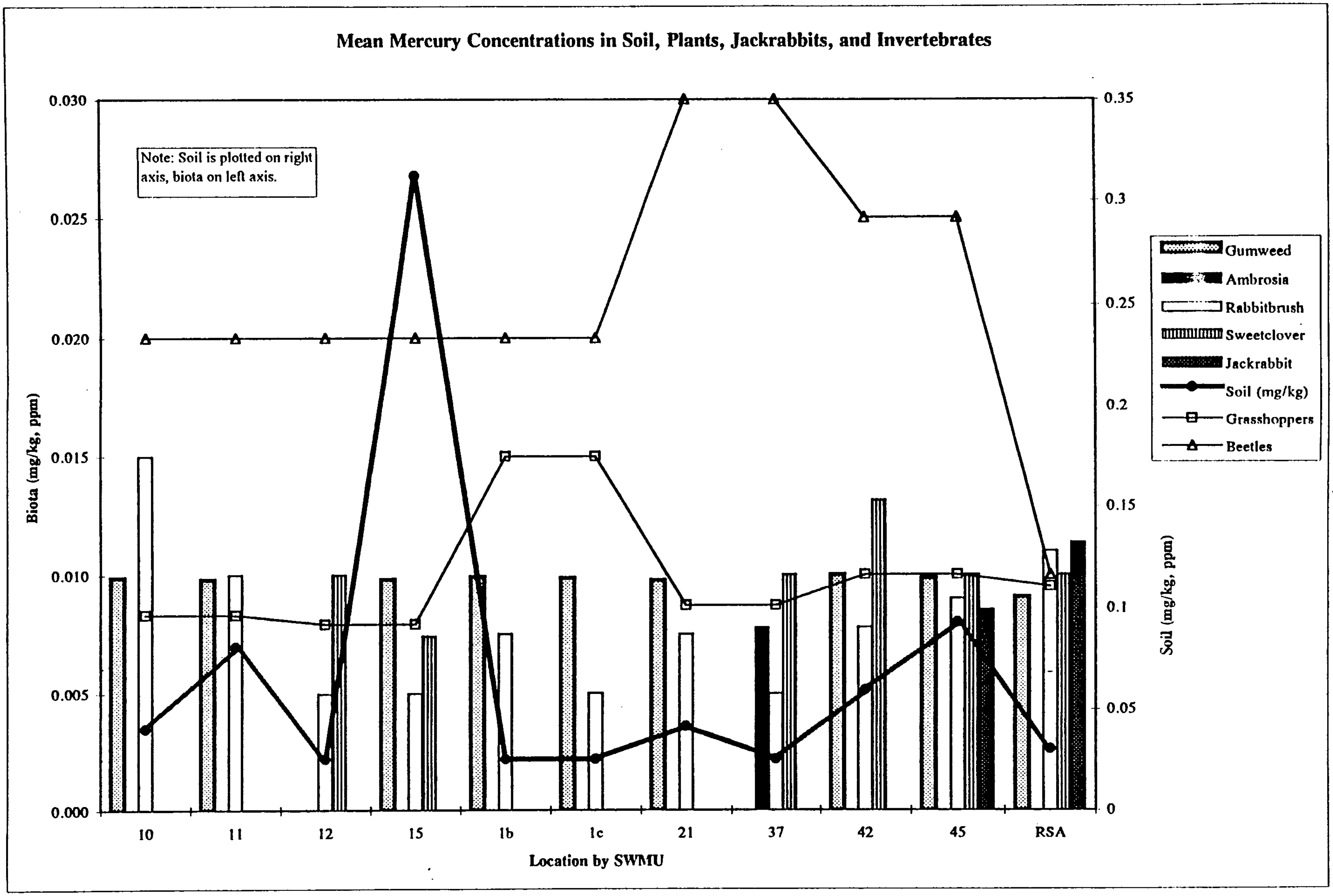

Figure 5-28. Mean Mercury Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

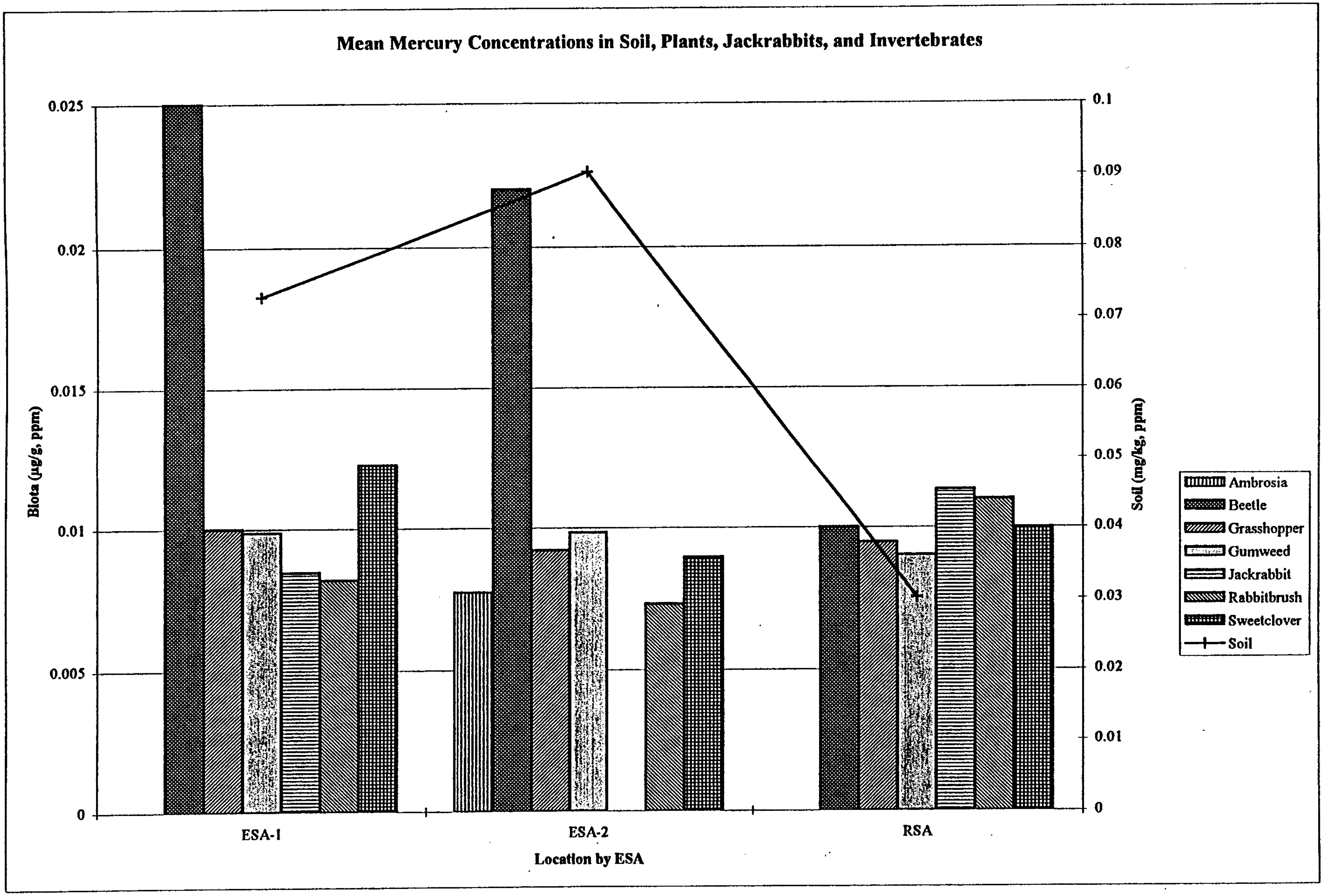

Figure 5-29. Mean Mercury Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

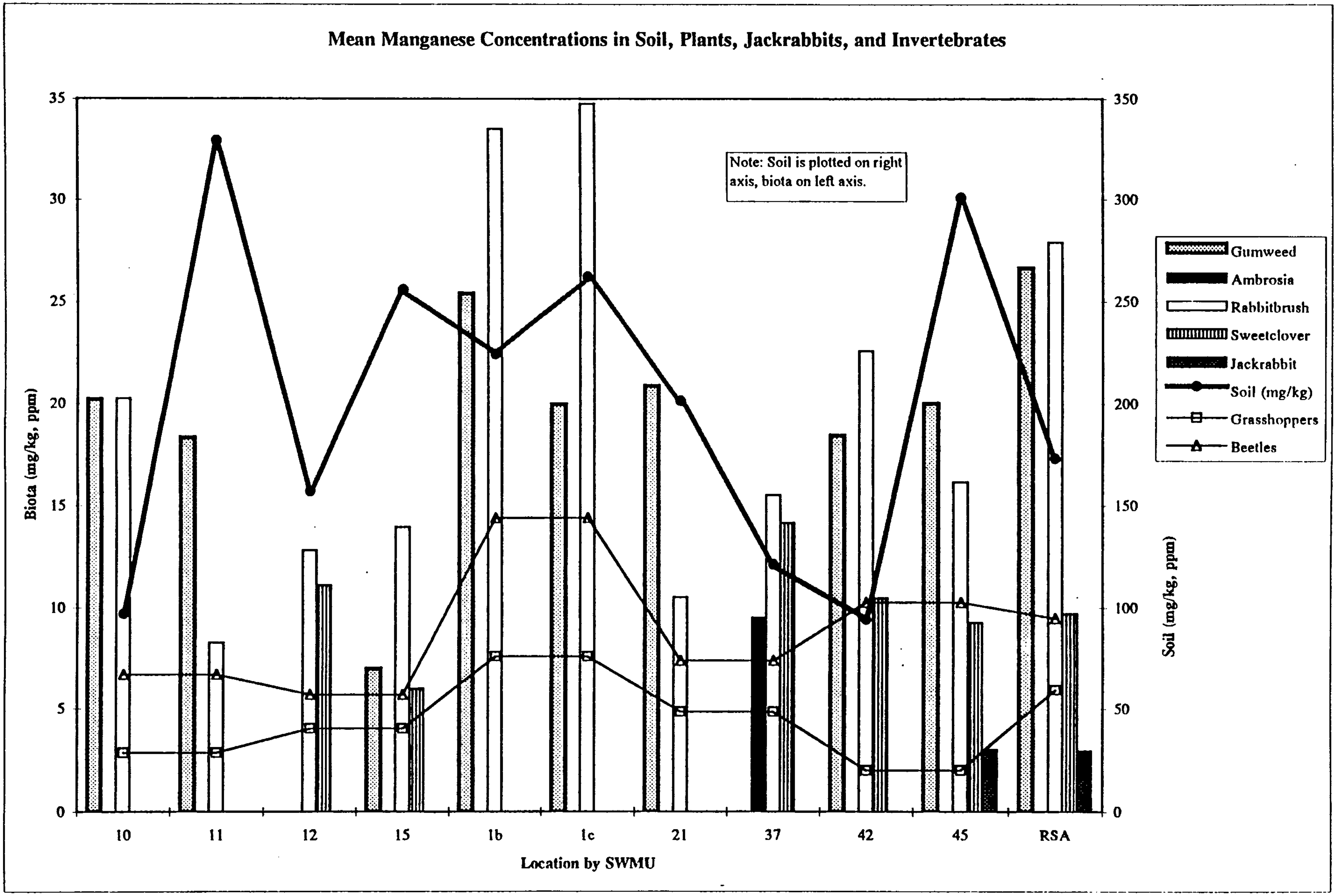

Figure 5-30. Mean Manganese Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

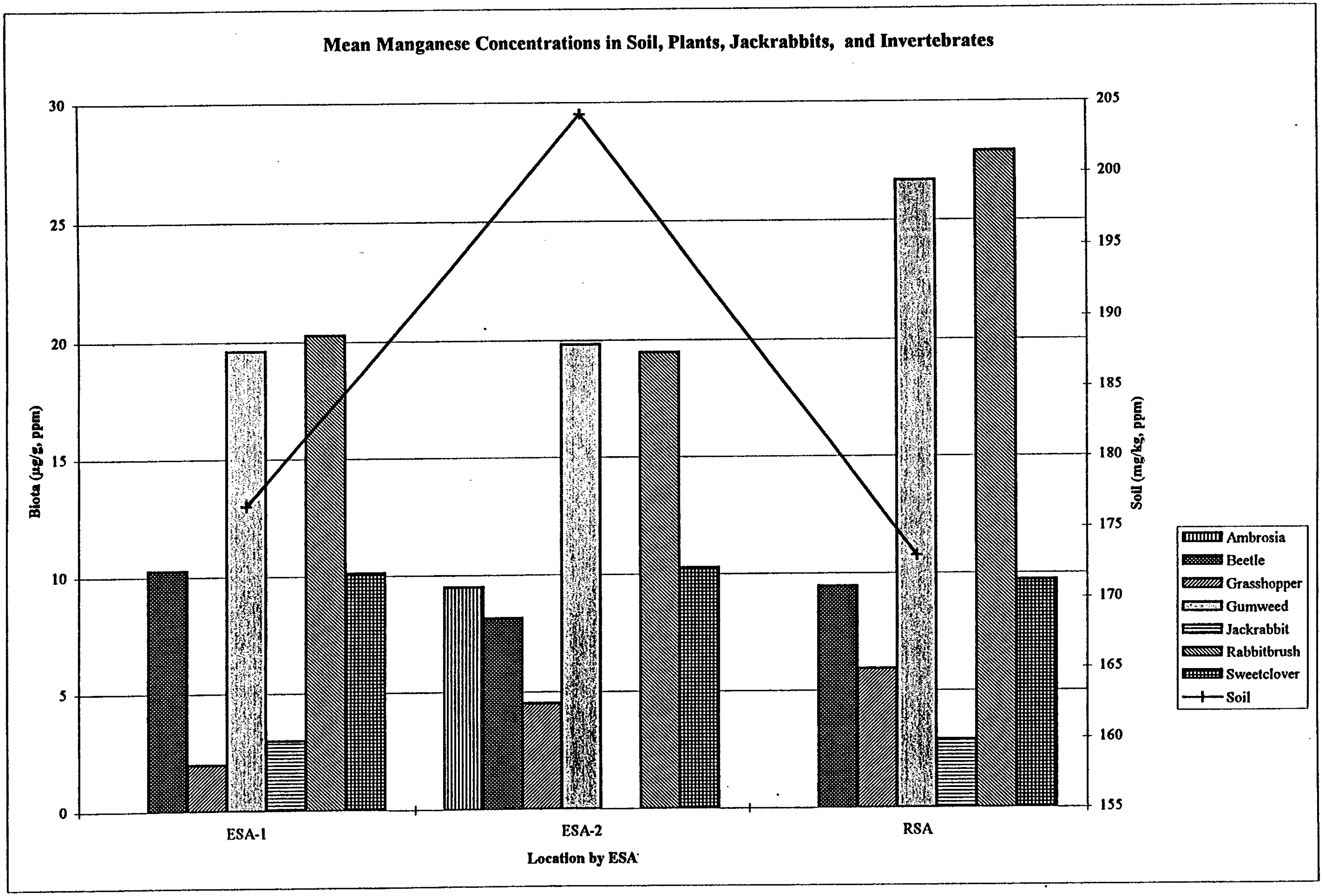

Figure 5-31. Mean Manganese Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

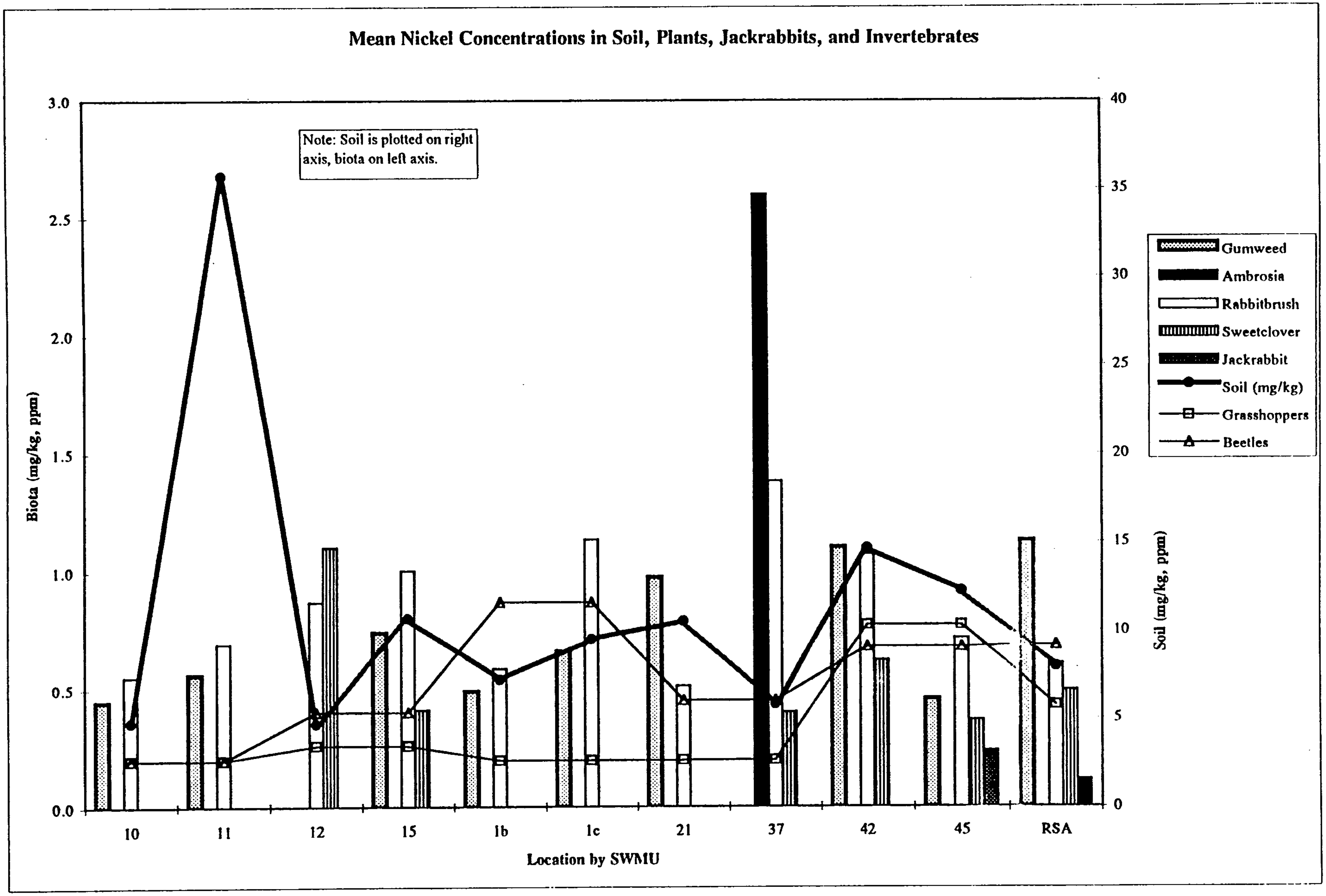

Figure 5-32. Mean Nickel Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

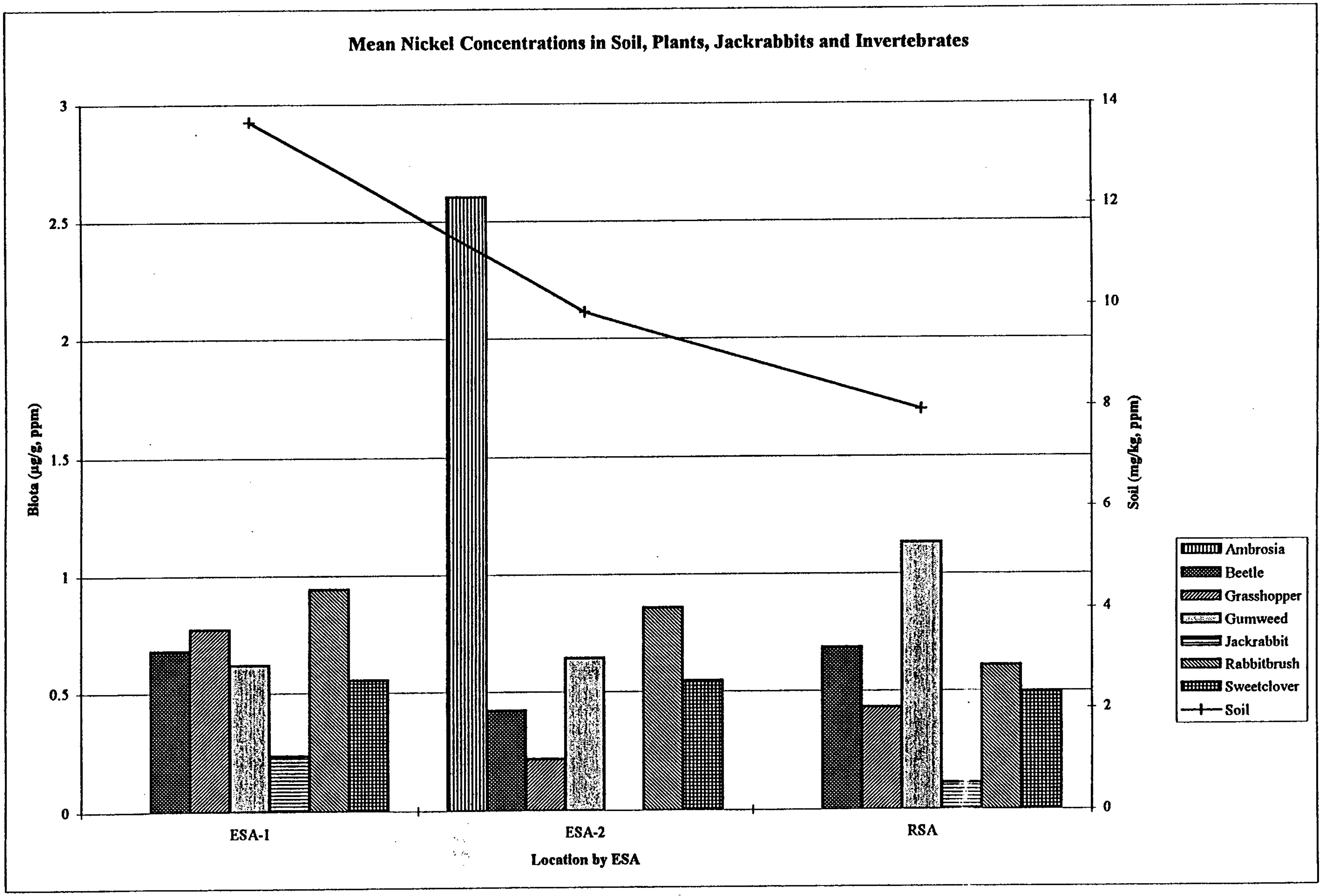

Figure 5-33. Mean Nickel Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

Lead

SWMU Basis

Although low in plants, lead concentrations were high in jackrabbits from SWMU 45 and the RSA, which may have been the result of encapsulated lead shot in the muscle tissue. Lead concentrations in vegetation at SWMUs 21 and 42 are much higher than other TEAD SWMUs and the RSA. Lead soil concentrations at SWMU 11 are much higher than all other locations (Figure 5-34).

ESA Basis

There is correlation between lead concentrations in soil and biota at the two ESAs and the RSA except in gumweed, which has its highest value at ESA-2 as seen on Figure 5-35.

Selenium

SWMU Basis

Selenium in biota appears consistent between TEAD SWMUs and the RSA with the exception of gumweed at SWMU 45. Selenium is somewhat higher in SWMU 15 and SWMU 42 soils. Selenium concentration in grasshoppers is higher in SWMUs 21 and 37 (Figure 5-36). Selenium was not detected in soils at the RSA.

ESA Basis

On an ESA basis, only selenium in gumweed tissue correlates with soil concentrations. Conversely, jackrabbit tissue concentrations are three times higher in the RSA than in ESA-1 despite a lower soil concentration (Figure 5-37).

Vanadium

SWMU Basis

Vanadium concentrations in gumweed are higher at SWMUs 1b, 21, 42, and the RSA. The distribution most likely represents location variability due to differences in soil types. Other than those locations, vanadium concentrations in vegetation are similar. Soil concentrations are fairly uniform between TEAD and the RSA (Figure 5-38). Vanadium concentrations in insects are generally higher in RSA samples.

ESA Basis

There is an inverse relationship between much of the vanadium biota data and soil results on an ESA basis as can be seen in Figure 5-39. The highest values for beetle, grasshopper, and gumweed tissue are reported for the RSA, which has the lowest soil detection.

Zinc

SWMU Basis

Zinc concentrations in biota are fairly uniform across SWMUs and the RSA with the exception of zinc in gumweed at SWMUs 15 and 21. Other than a high concentration in soil at SWMU 11, zinc soil concentrations are very consistent (Figure 5-40).

Mean Lead Concentrations in Soil, Plants, Jackrabbits, and Invertebrates

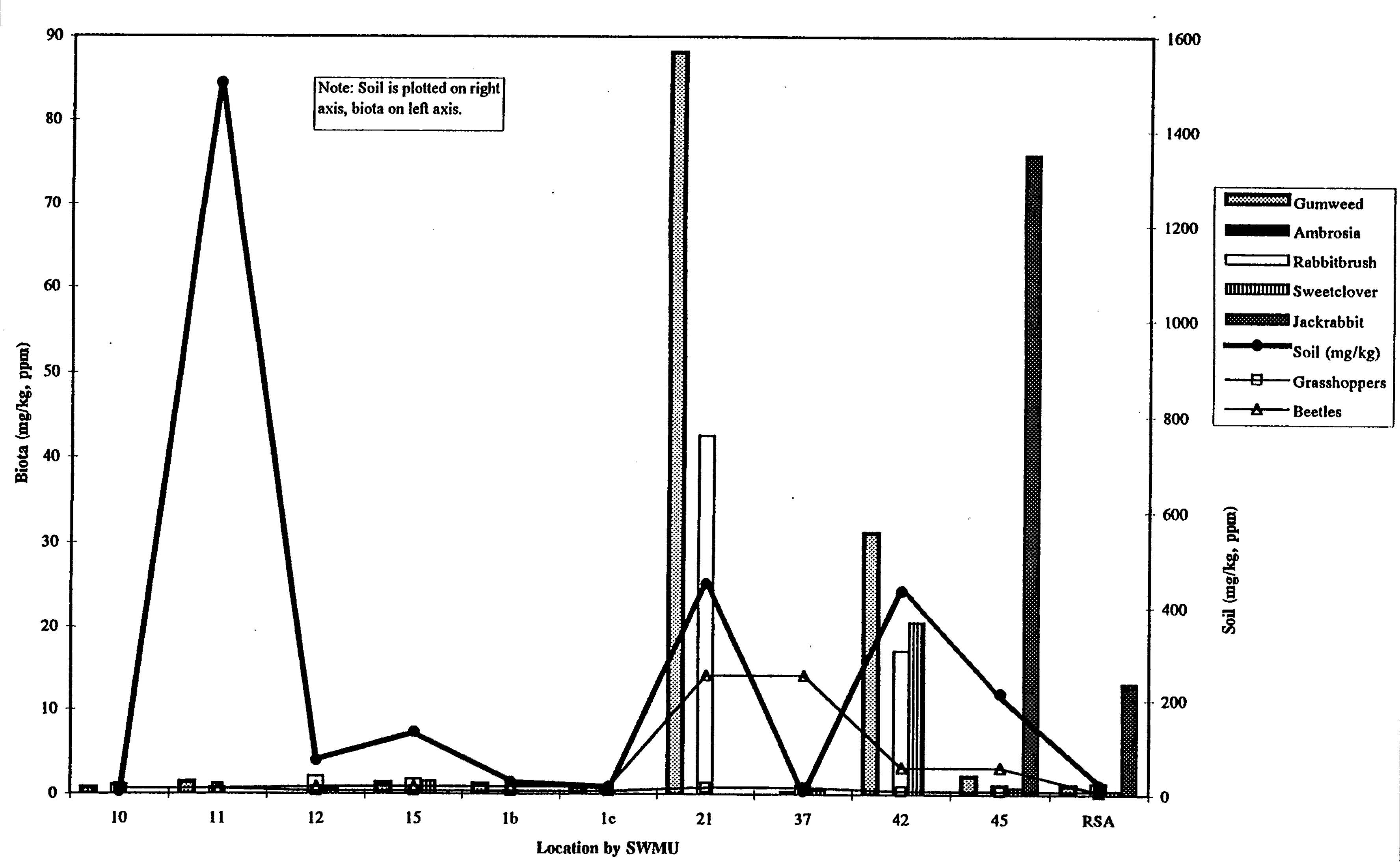

Figure 5-34. Mean Lead Concentrations in Soil, Plants, Jackrabbits, and Invertebrates - SWMU Basis

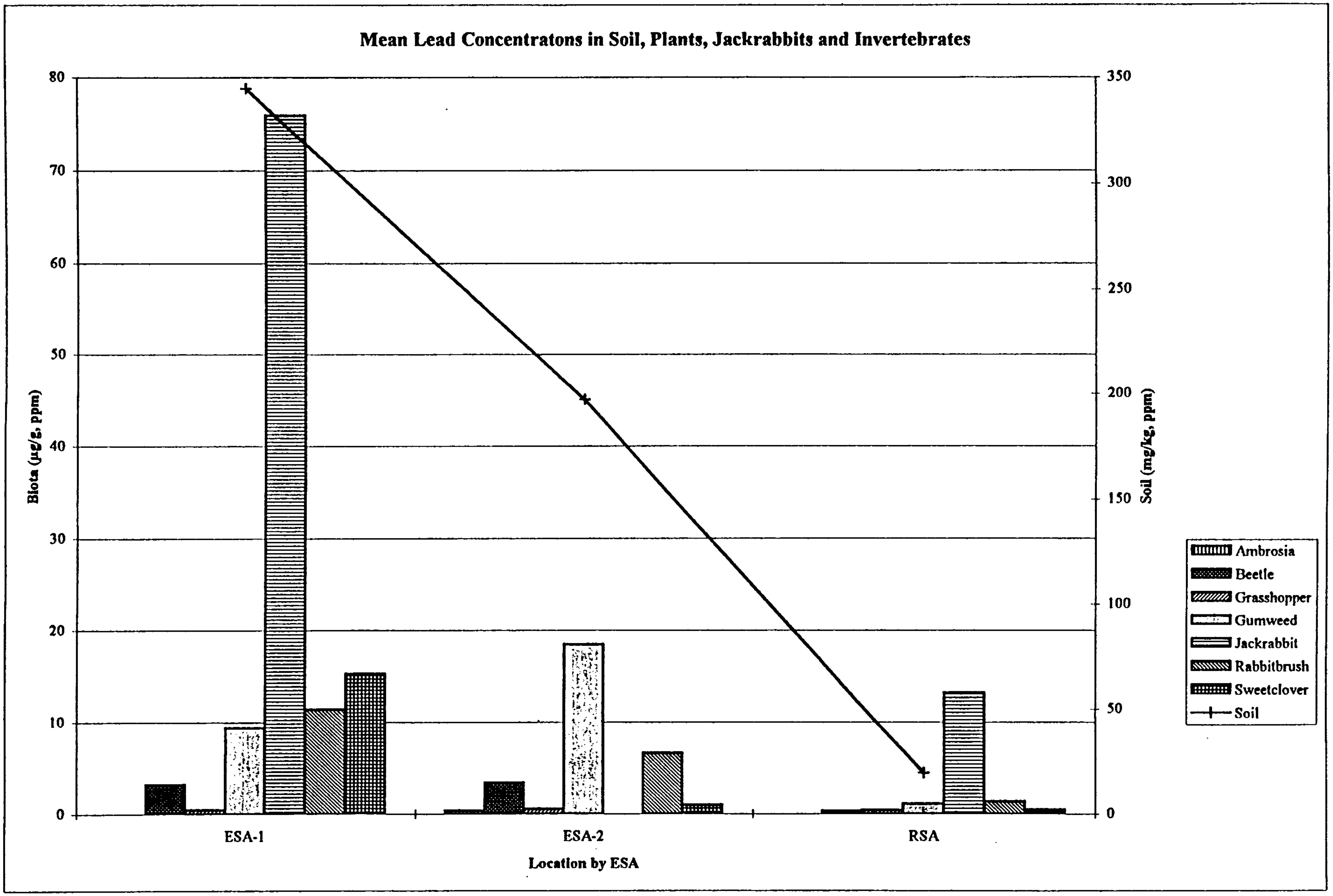

Figure 5-35. Mean Lead Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

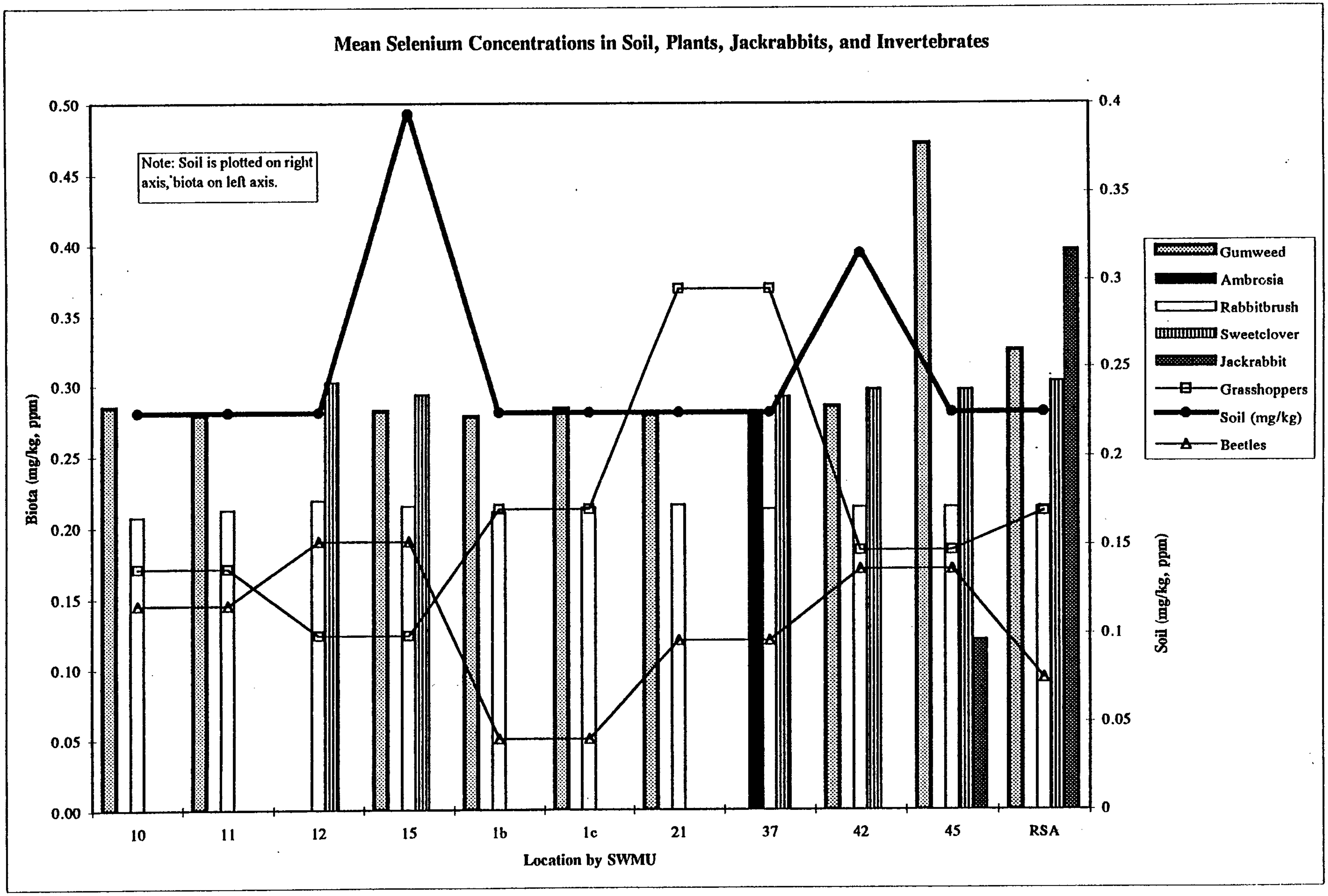

Figure 5-36. Mean Selenium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

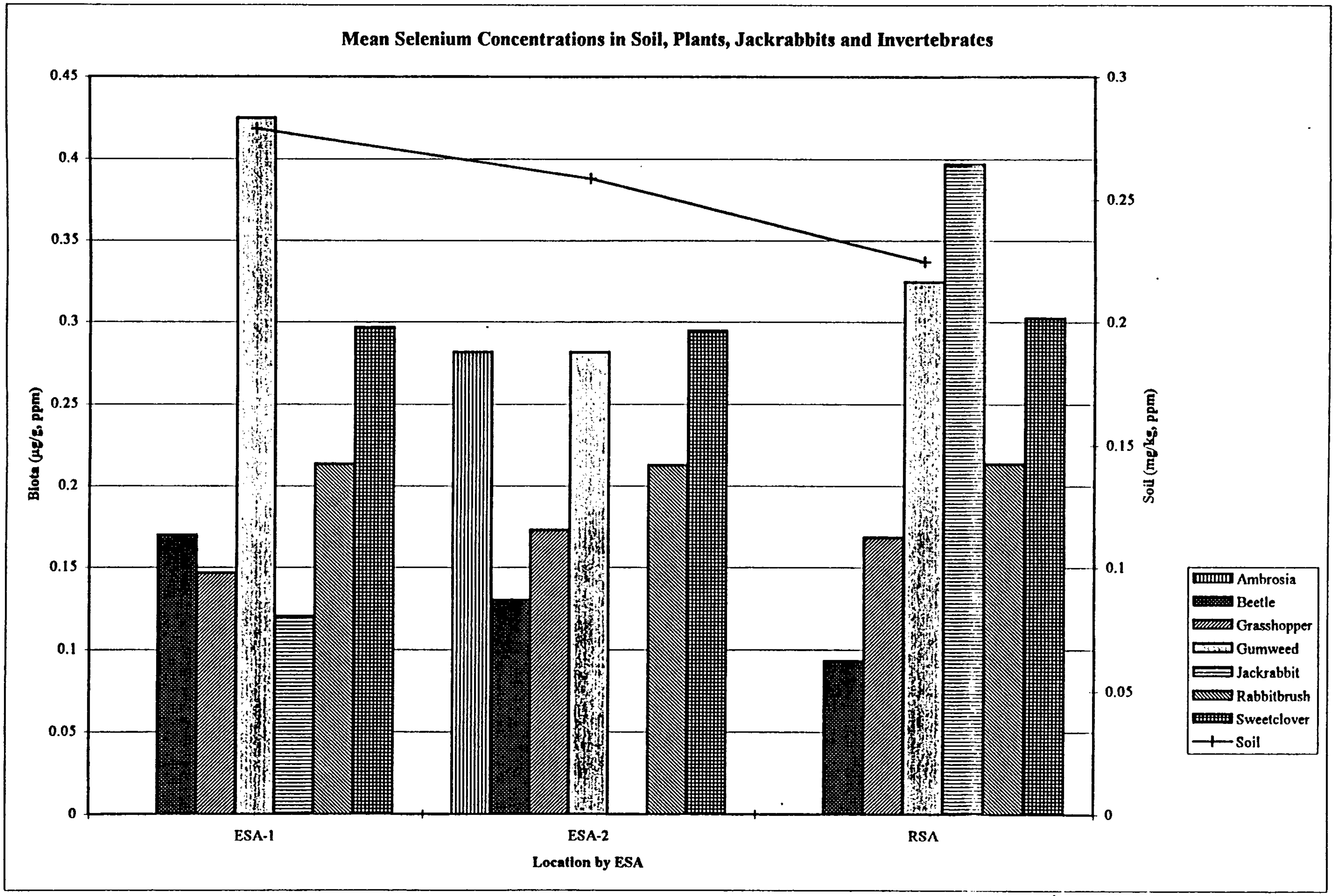

Figure 5-37. Mean Selenium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

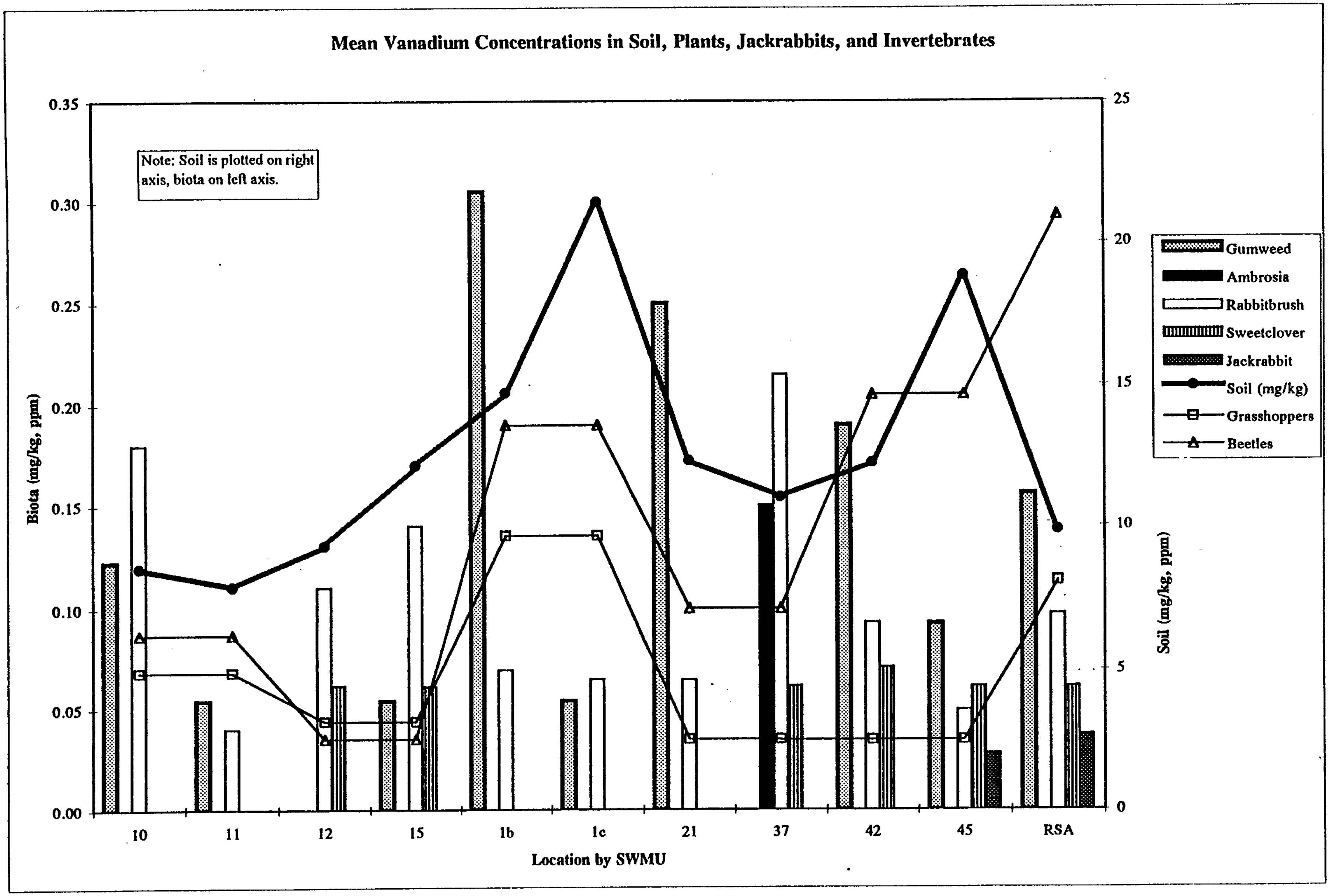

Figure 5-38. Mean Vanadium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

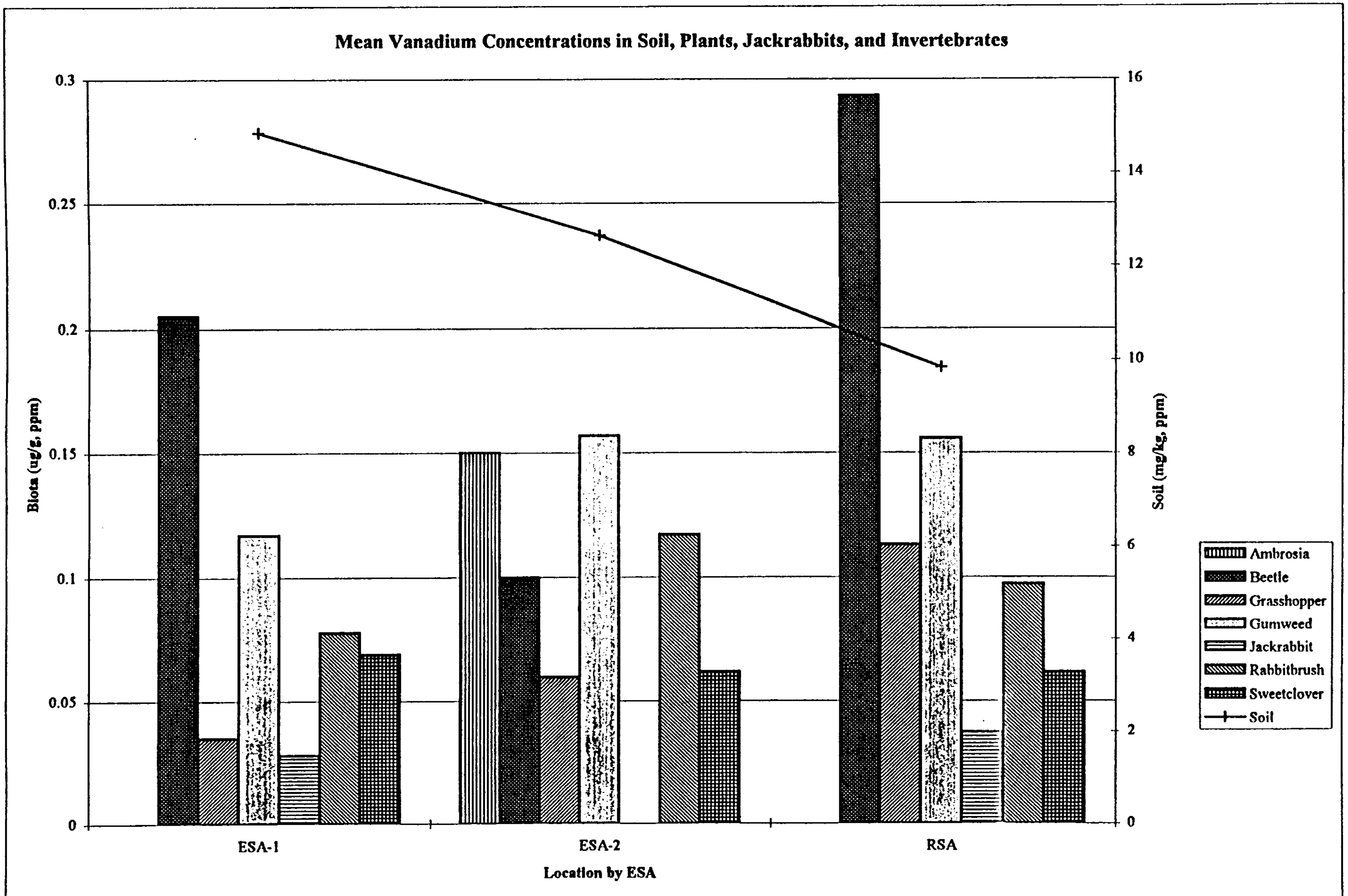

Figure 5-39. Mean Vanadium Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

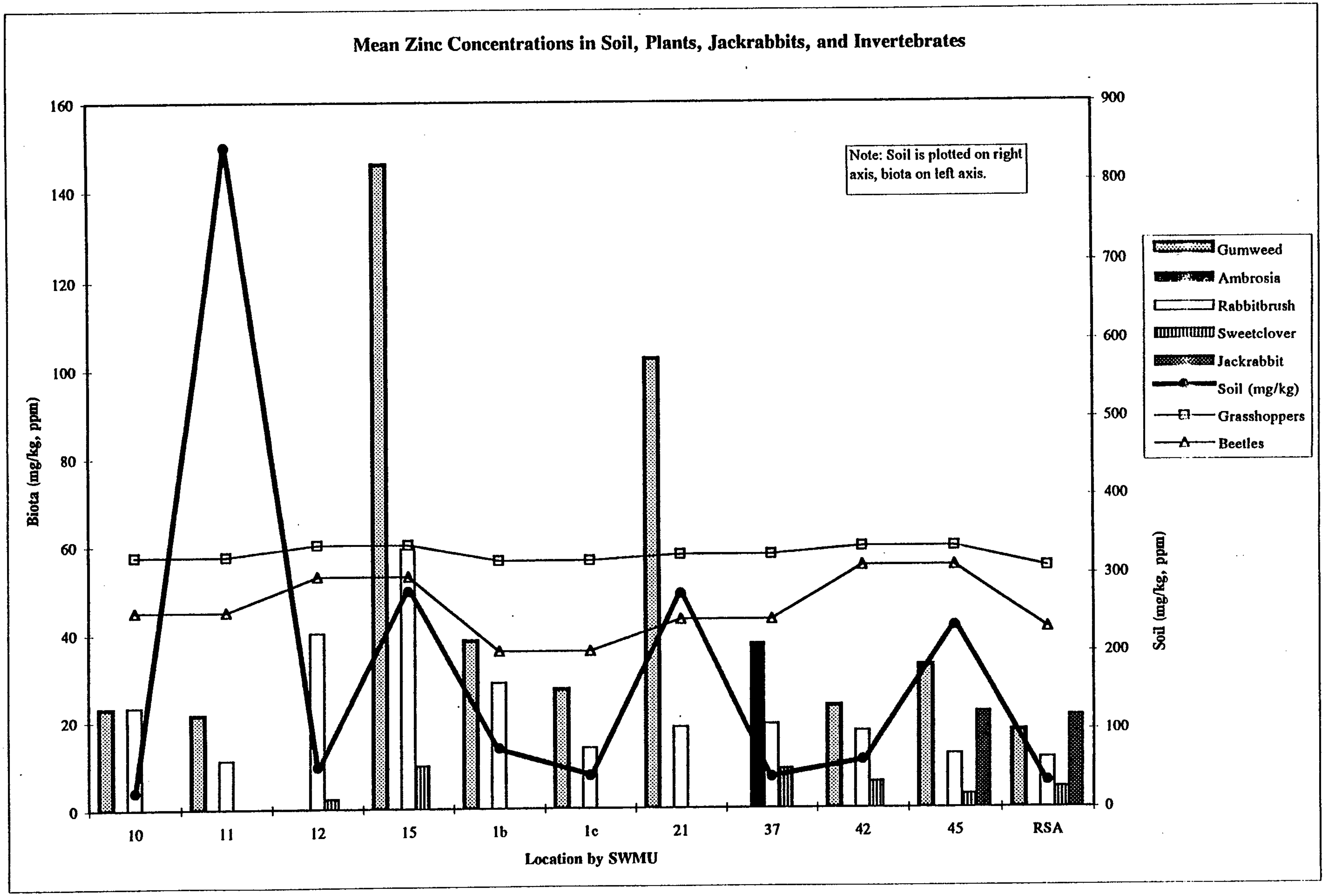

Figure 5-40. Mean Zinc Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

ESA Basis

The values for zinc detections in biota are fairly comparable across the three areas. Soil detections range by a factor of up to six (Figure 5-41).

5.11.2 Mean Concentration of DDE in Soil Relative to Mean Concentrations of DDE in Biota

DDT (2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane) and DDE (2,2-Bis(p-chlorophenyl)-1,1-dichloroethene) are expected to bioaccumulate, unlike many of the metals that can be regulated physiologically.

SWMU Basis
DDT was not detected in any plant sample but was detected in several insect samples (Figure 5-42). Low concentrations of DDE, DDT, and DDD were detected in soil samples from SWMUs 15, 42, and 45. DDT was detected in only 2 out of 16 soil samples at the RSA at a maximum concentration of 6.7 ppb. Most soil values that contributed to the Cterm were primarily below the CRL of 3.5 μg/kg (ppb). The detection limits for DDT in gumweed and rabbitbrush were 23 and 48 μg/kg (ppb), respectively, and, therefore, the nondetects gave an apparent BAF of nearly 15 to 30. Further, matrix interferences in a SWMU 42 gumweed sample results in a non-detect reported a value of 67 ppb.

The graph indicates DDE was detected in all rabbitbrush samples due to the detection frequency and statistical treatment of nondetects; detects occurred, however, in only a few instances in rabbitbrush (SWMUs 11, 15, 42, 45, and 1c and the RSA), three times in jackrabbit tissue at SWMU 45, and once in jackrabbit tissue at the RSA. The concentrations in vegetation at all ESA SWMUs, except for DDE in rabbitbrush at SWMU 11, were similar to the RSA, although the soil concentrations differed by approximately an order of magnitude (Figure 5-43).

ESA Basis
Except for greater values of DDT and DDE in ESA-1 beetle tissue, all other detects are very comparable between the two ESAs and the RSA, despite a difference in soil concentrations (Figures 5-44 and 5-45).

5.11.3 Mean Concentration of RDX and 2,4,6-TNT in Soil Relative to Mean Concentrations of RDX and 2,4,6-TNT in Biota

Explosives were not analyzed in jackrabbit or invertebrate tissue, due to extensive and rapid metabolism in mammals and invertebrates, and a lack of invertebrate sample material for analysis. Explosives were below detection in soils; however, RDX (cyclonite) and 2,4,6-TNT (2,4,6-trinitrotoluene) were detected in biota.

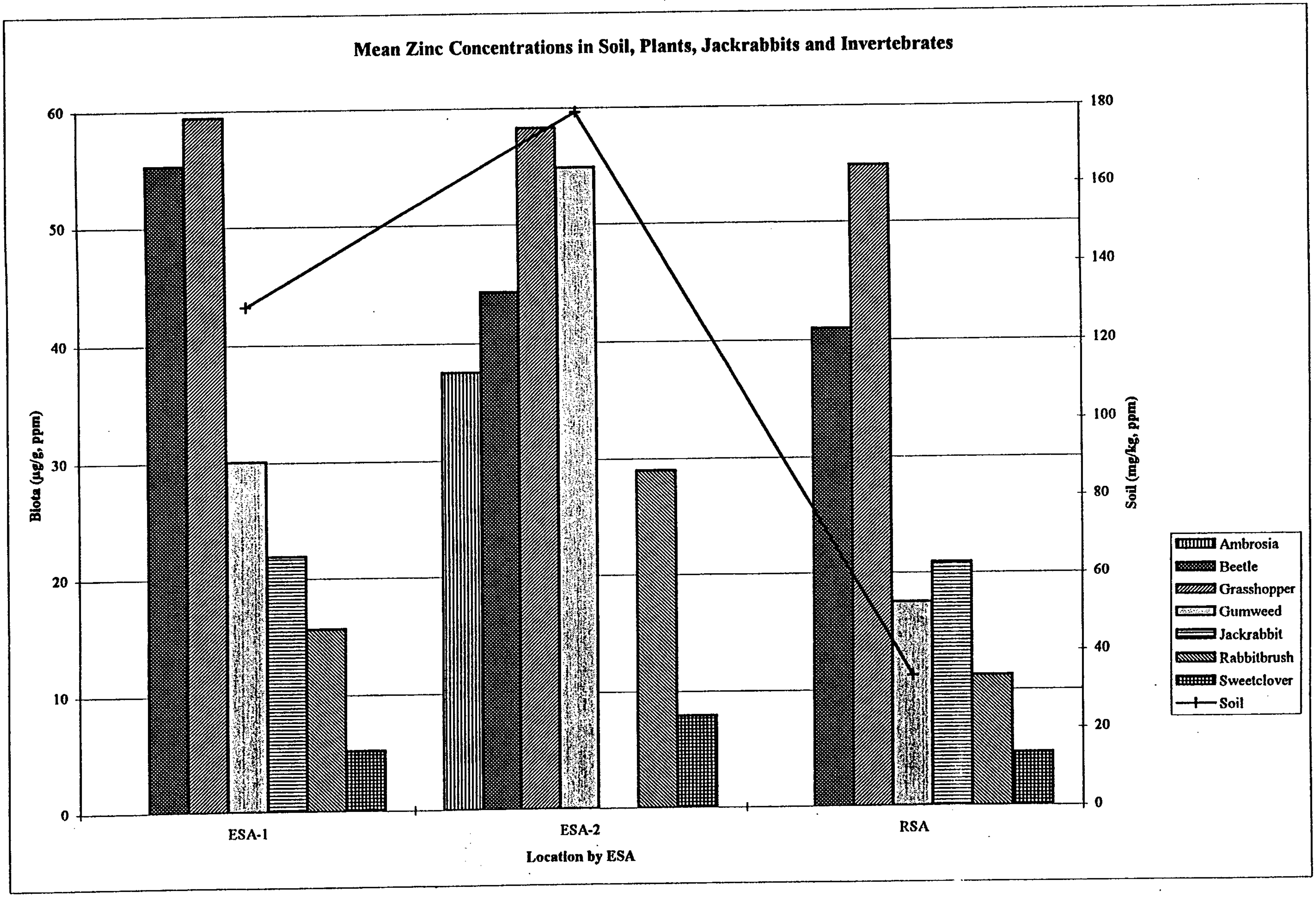

Figure 5-41. Mean Zinc Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

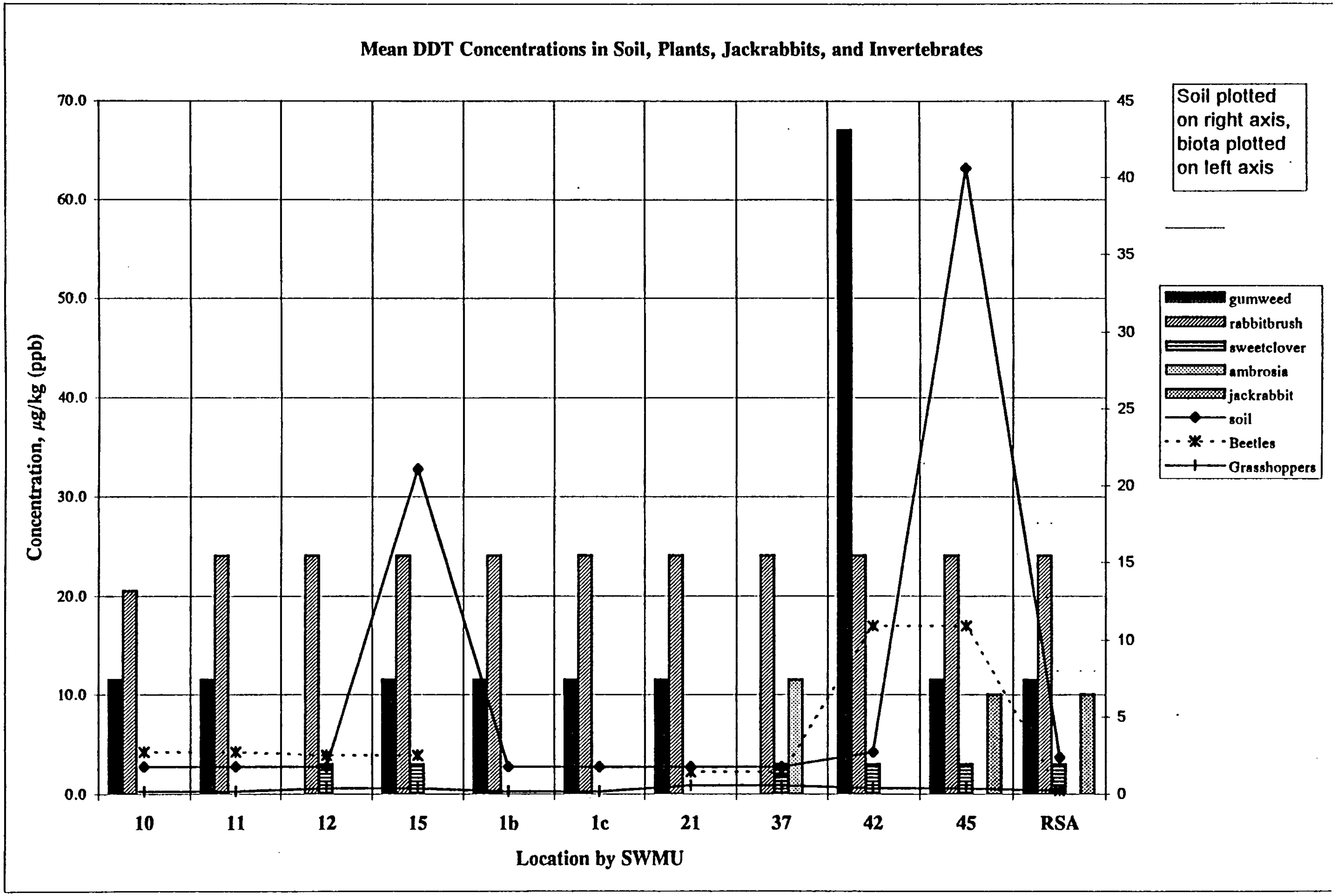

Figure 5-42. Mean DDT Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-SWMU Basis

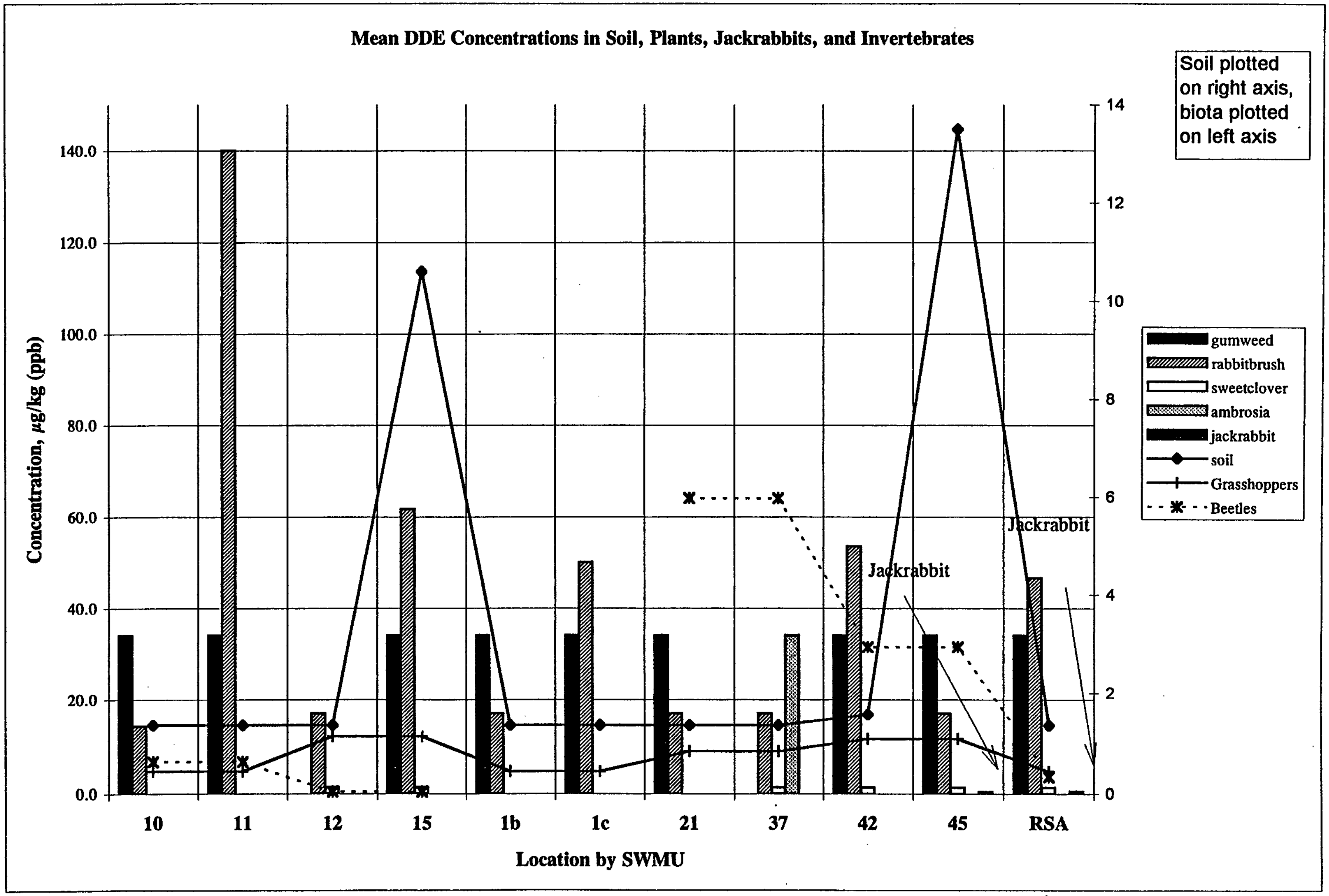

Figure 5-43. Mean DDE Concentrations in Soil, Plants, Jackrabbits, and Invertebrates - SWMU Basis

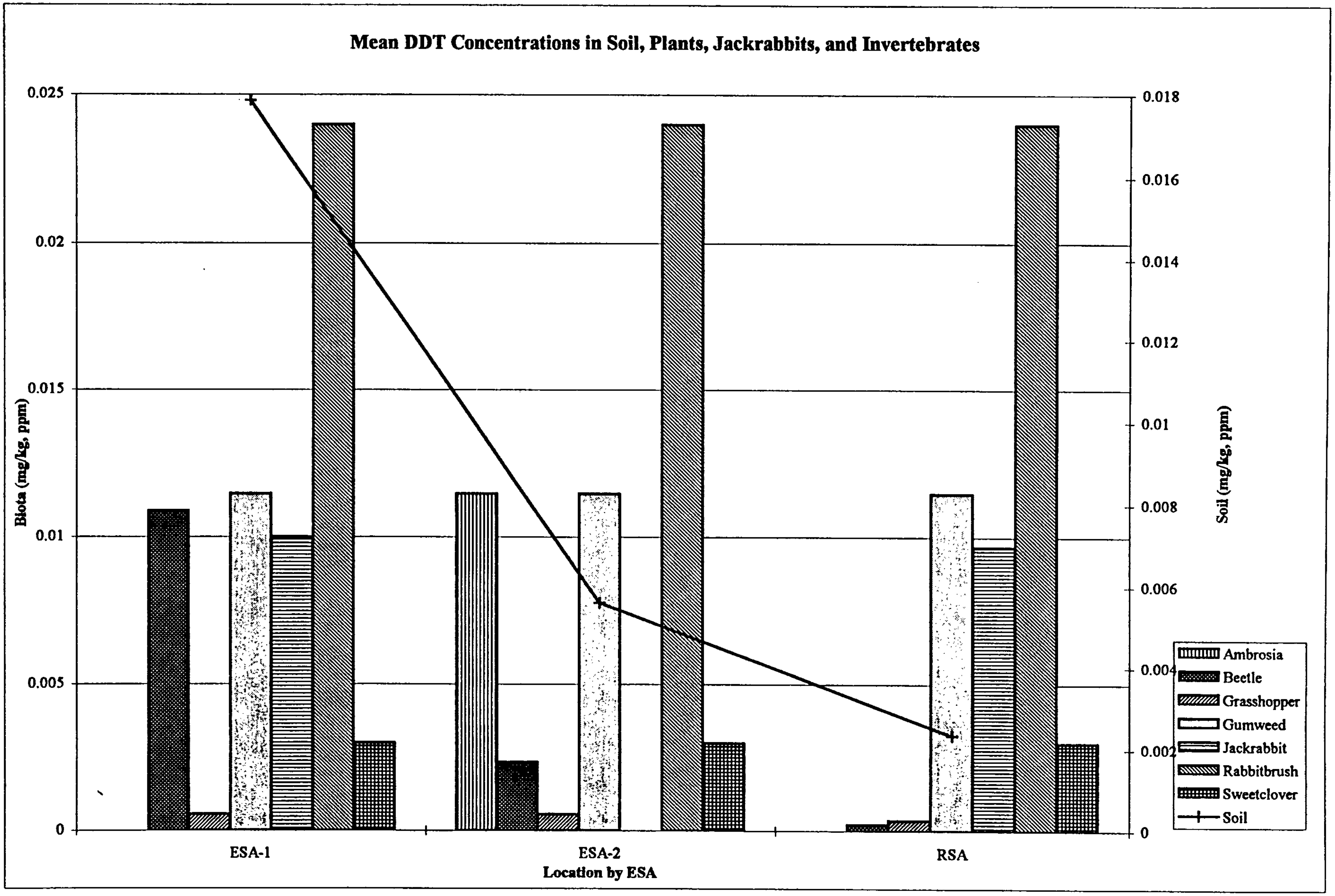

Figure 5-44. Mean DDT Concentrations in Soil, Plants, Jackrabbits, and Invertebrates - ESA Basis

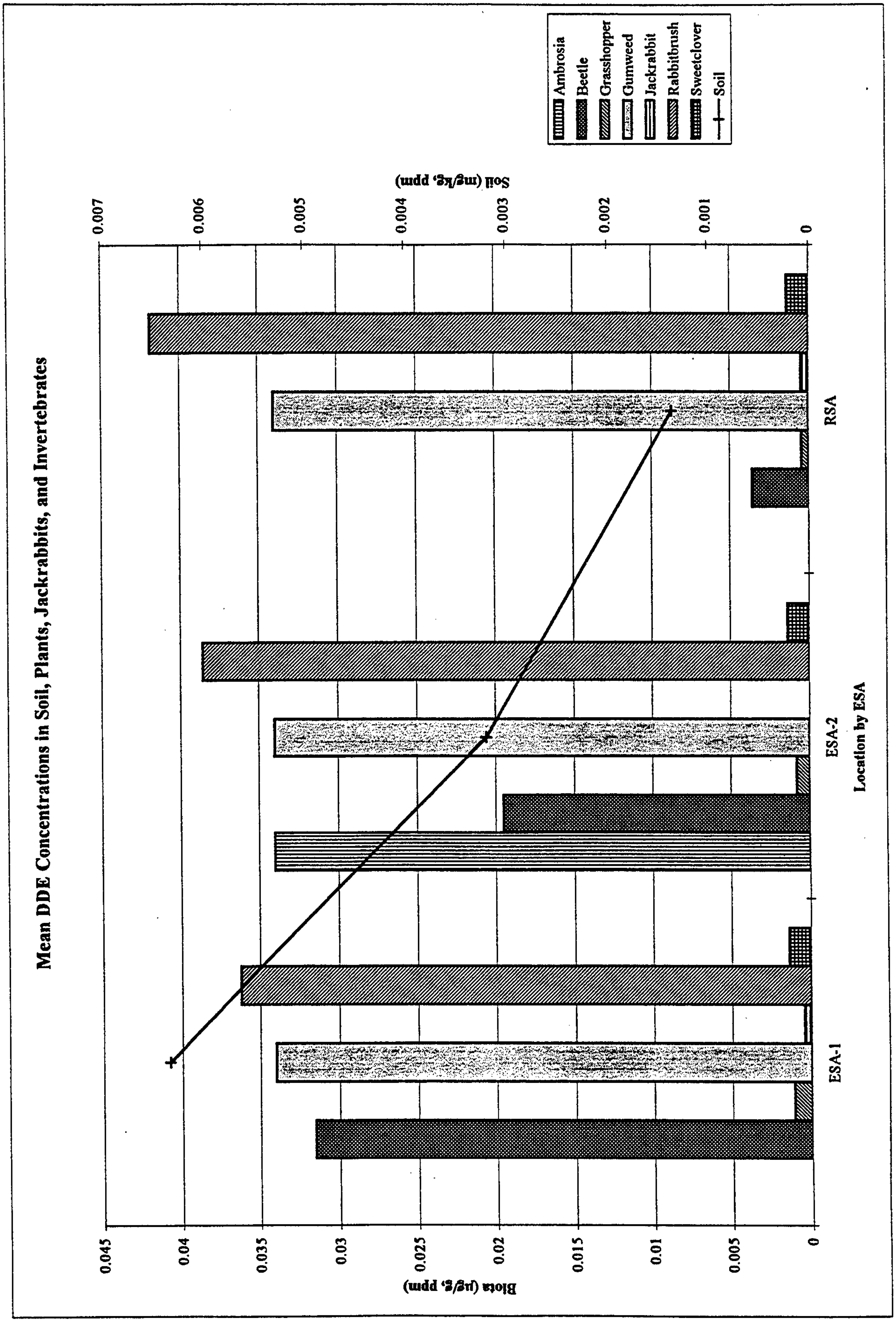

Figure 5-45. Mean DDE Concentrations in Soil, Plants, Jackrabbits, and Invertebrates-ESA Basis

SWMU Basis
The scale on the RDX graph (Figure 5-46) differs from the scale for figures for the metals because the detection limits for explosives in gumweed and rabbitbrush were much higher (left axis). Soils and other biota are reported on the right axis. High concentrations of RDX were reported in ambrosia (SWMU 37) and sweetclover (SWMU 45). The highest concentrations reported in rabbitbrush and gumweed from SWMU 10 are also noteworthy, and were not rejected by the laboratory although these were difficult matrices for that analysis. The explosive 2,4,6-TNT was below detection in soils but occurred at high concentrations in rabbitbrush from SWMU 10. The concentrations in gumweed reflect the high detection limits (Figure 5-47).

ESA Basis
RDX values for ESA-2 are generally higher than for ESA-1 and the RSA, perhaps due to the larger number of samples taken at ESA-2 (Figure 5-48). There is some variance in gumweed concentrations in TNT between the three areas although the soil concentration is constant (Figure 5-49).

5.11.4 Mean Concentration of PAHs in Soil Relative to Mean Concentrations of PAHs in Biota

SWMU Basis
The detections of PAHs in biota were consistently low for all analytes at all locations at TEAD SWMUs and the RSA (Figures 5-50 through 5-55). Pyrene is also known as benzo(def)-phenanthrene. The consistency patterns are also due to the large number of non-detects in both soil and biota. SWMUs 12, 15, and 37 show the highest PAH detections in both matrices. The RSA distributions are quite similar to TEAD.

ESA Basis
As may be predicted from the SWMU-by-SWMU analysis, ESA-2 values for both soil and most biota are highest at ESA-2 (Figures 5-56 through 5-61). Phenanthrene (see Figure 5-60) values for gumweed and rabbitbrush are higher at ESA-1 than at the other two areas even though the highest soil value is at ESA-2.

5.11.5 Mean Concentrations of Dioxins/Furans in Soil Relative to Mean Concentrations of Dioxin/Furans in Biota

The biota samples were analyzed by USEPA method SW-846 8290, which is the high resolution gas chromatography/mass spectrometry procedure capable of detections in the parts per trillion range. Soil data were analyzed by SW-846 Method 8280, which is a less sensitive analysis typically in the parts per billion to parts per million range. This fact is reflected in the two different scales used in Figures 5-62 through 5-65. It is interesting to note that for the most part, the biota and soil results are consistent with one another. This consistency is also

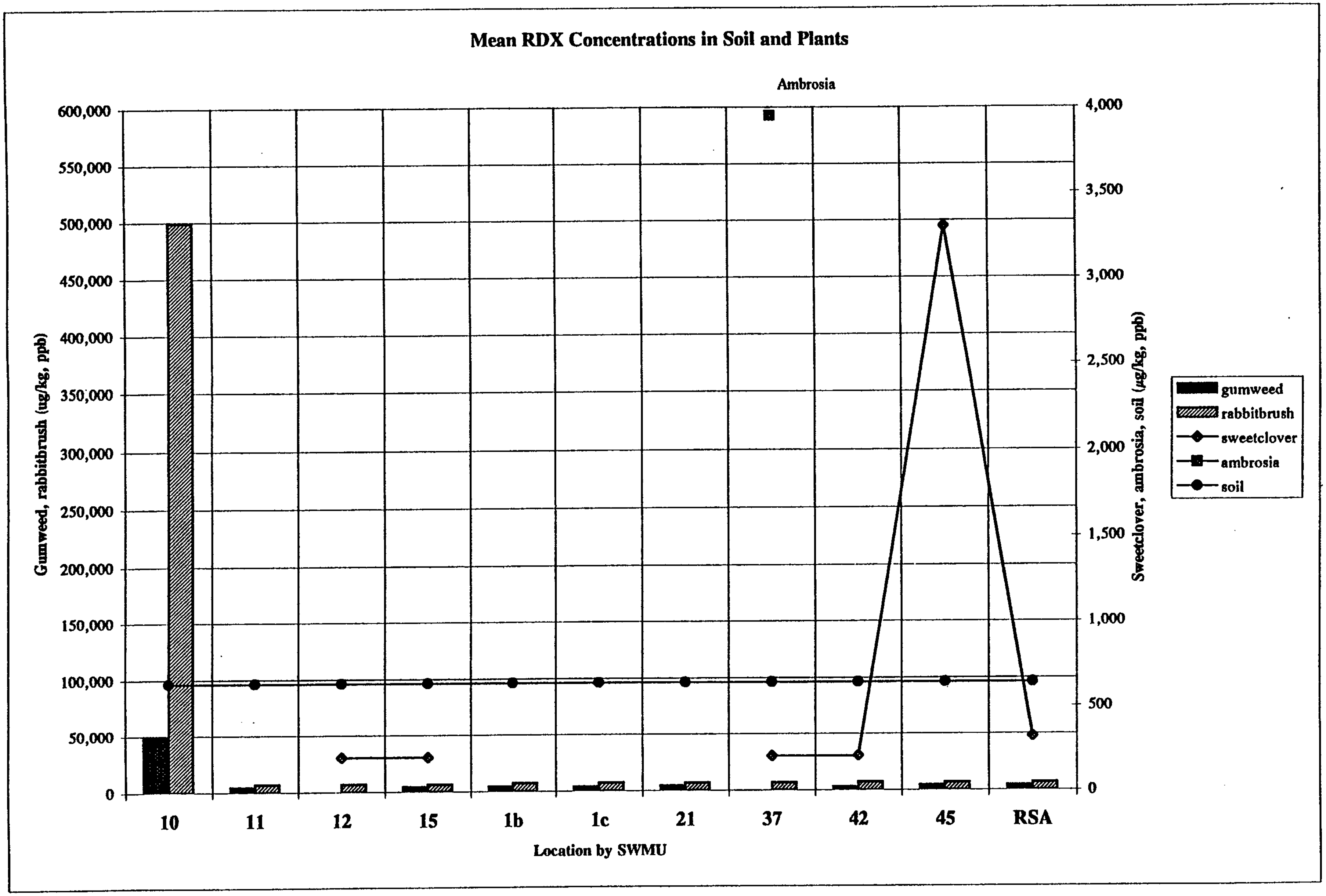

Figure 5-46. Mean RDX Concentrations in Soil and Plants - SWMU Basis

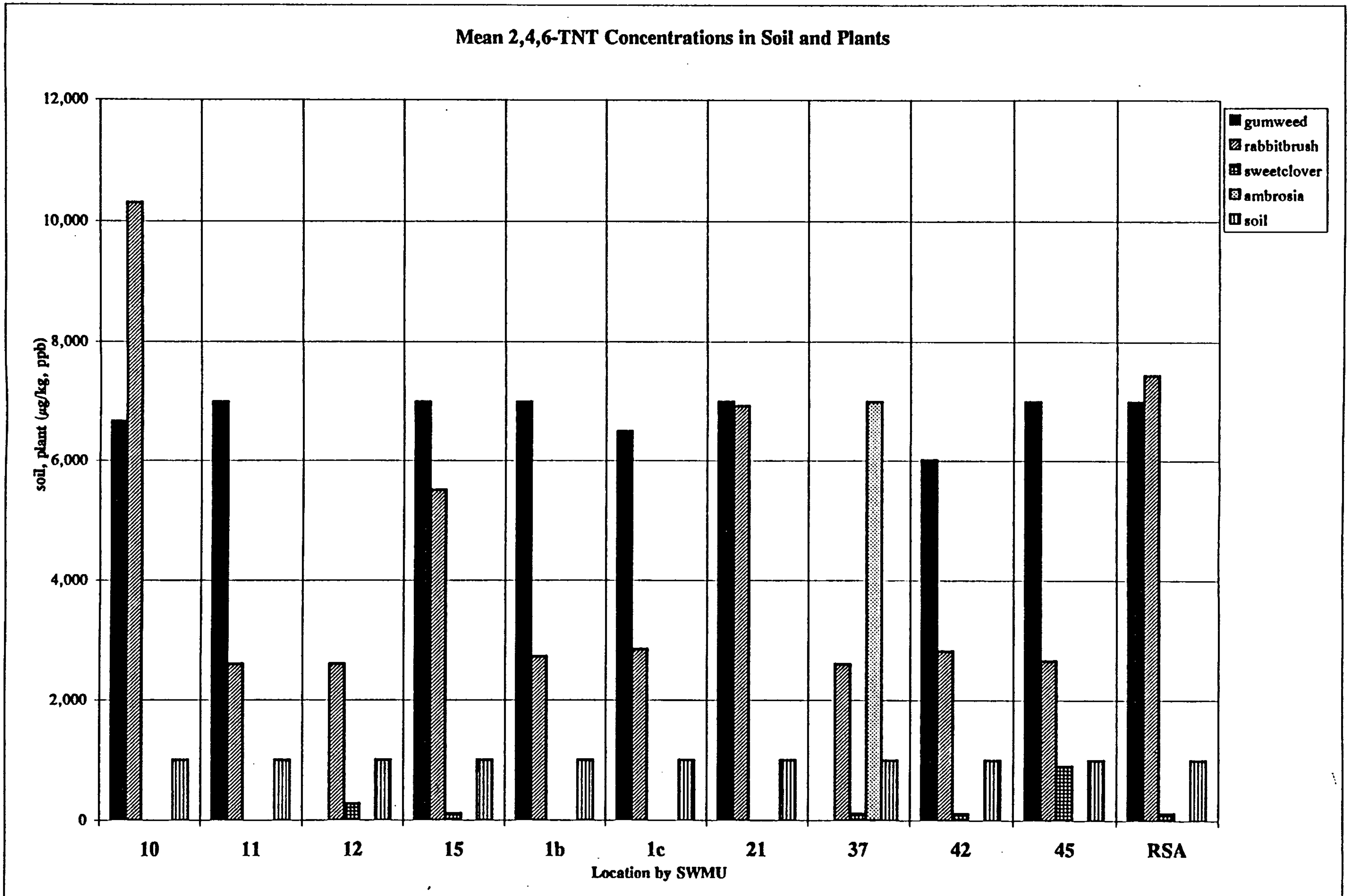

Figure 5-47. Mean 2,4,6-TNT Concentrations in Soil and Plants - SWMU Basis

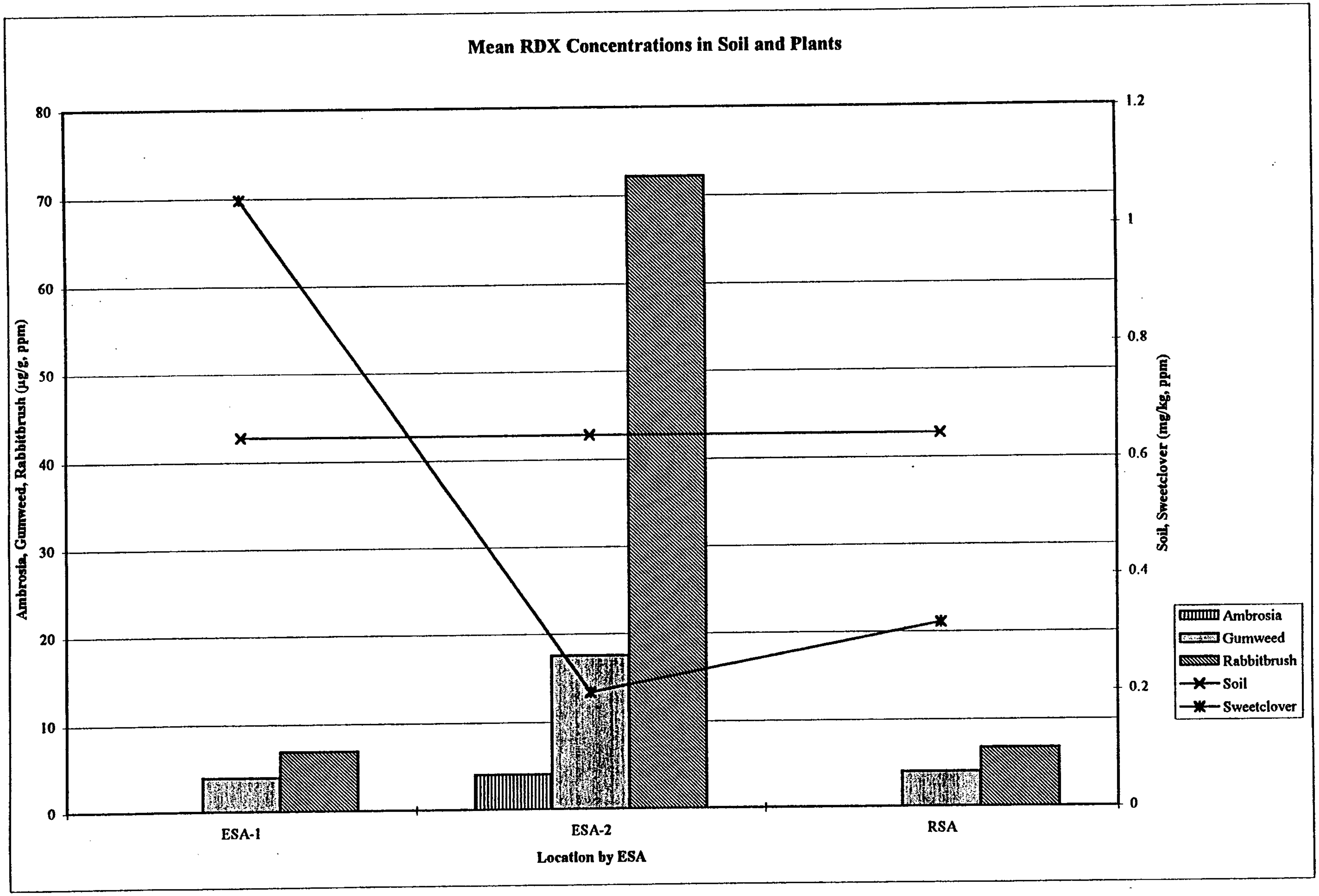

Figure 5-48. Mean RDX Concentrations in Soil and Plants - ESA Basis

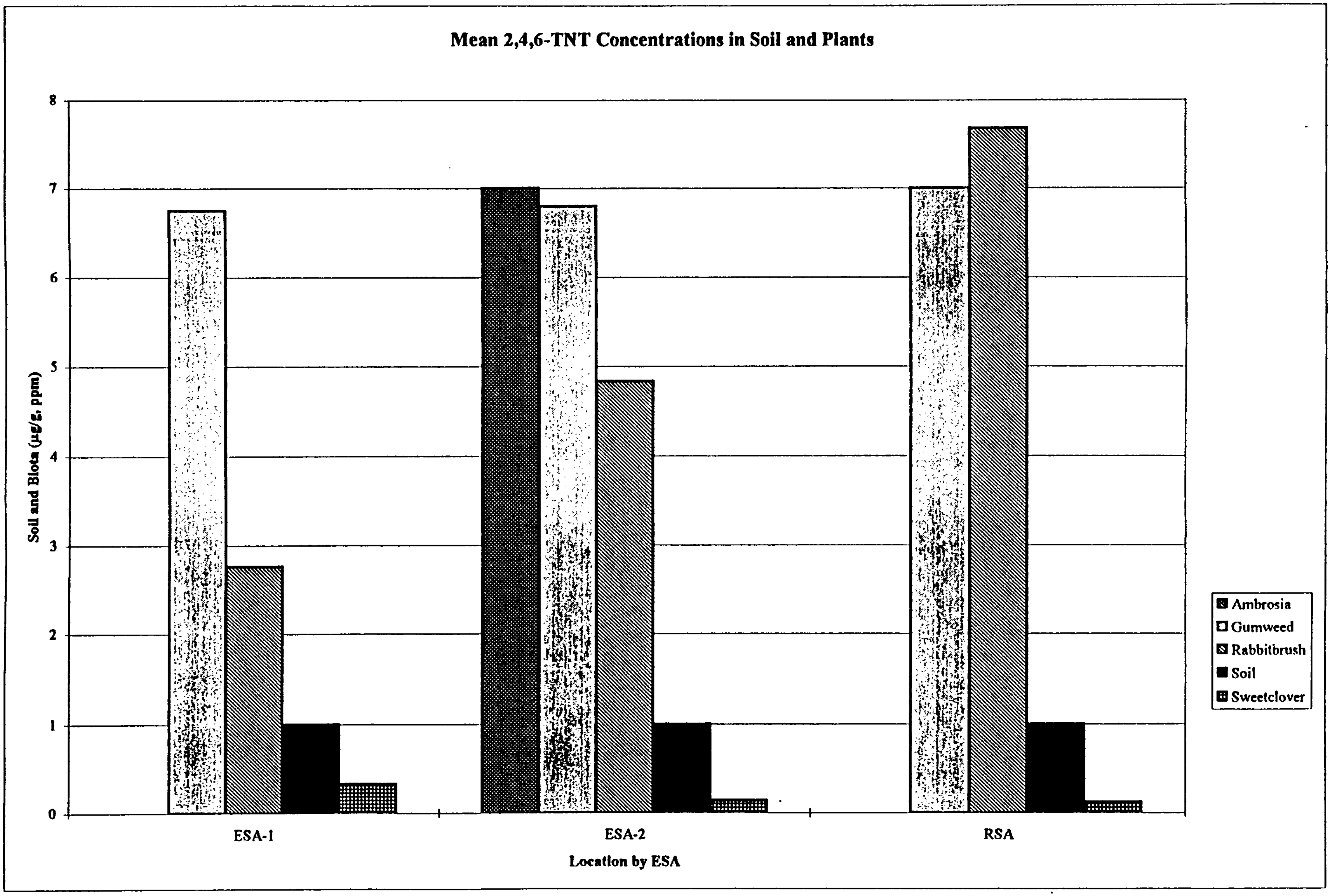

Figure 5-49. Mean 2,4,6-TNT Concentrations in Soil and Plants - ESA Basis

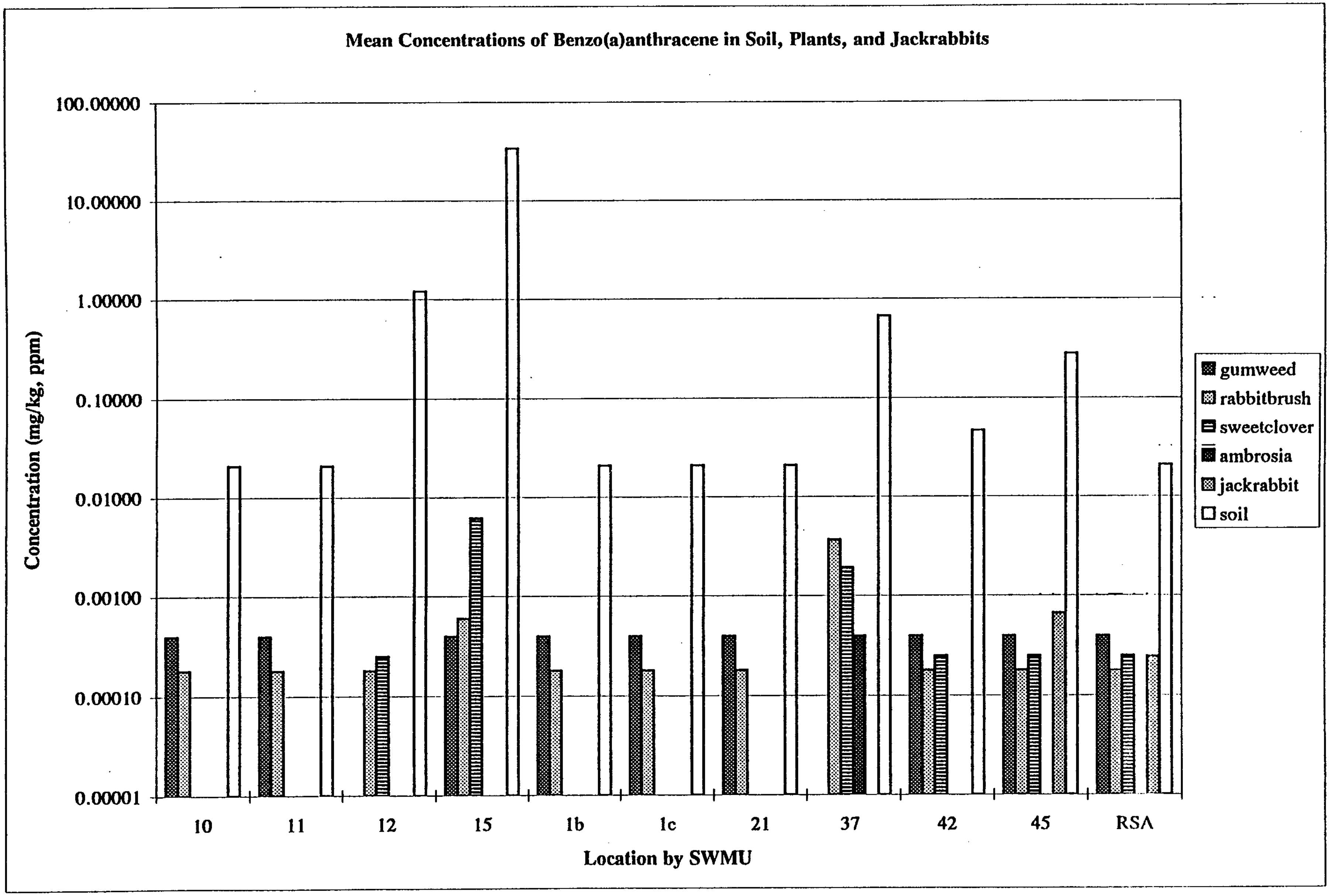

Figure 5-50. Mean Benzo(a)anthracene Concentrations in Soil, Plants, and Jackrabbits - SWMU Basis

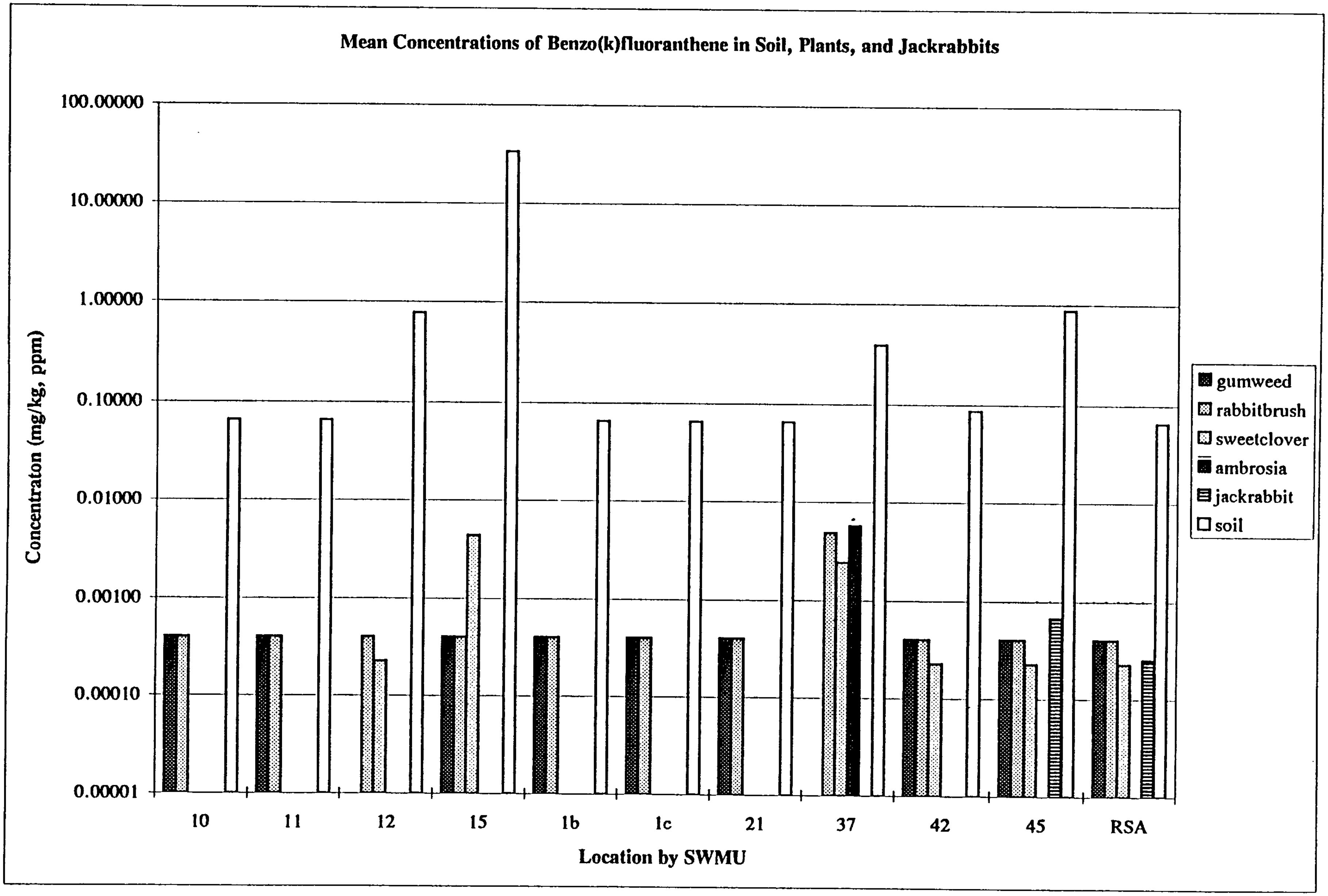

Figure 5-51. Mean Benzo(k)fluoranthene Concentrations in Soil, Plants, and Jackrabbits - SWMU Basis

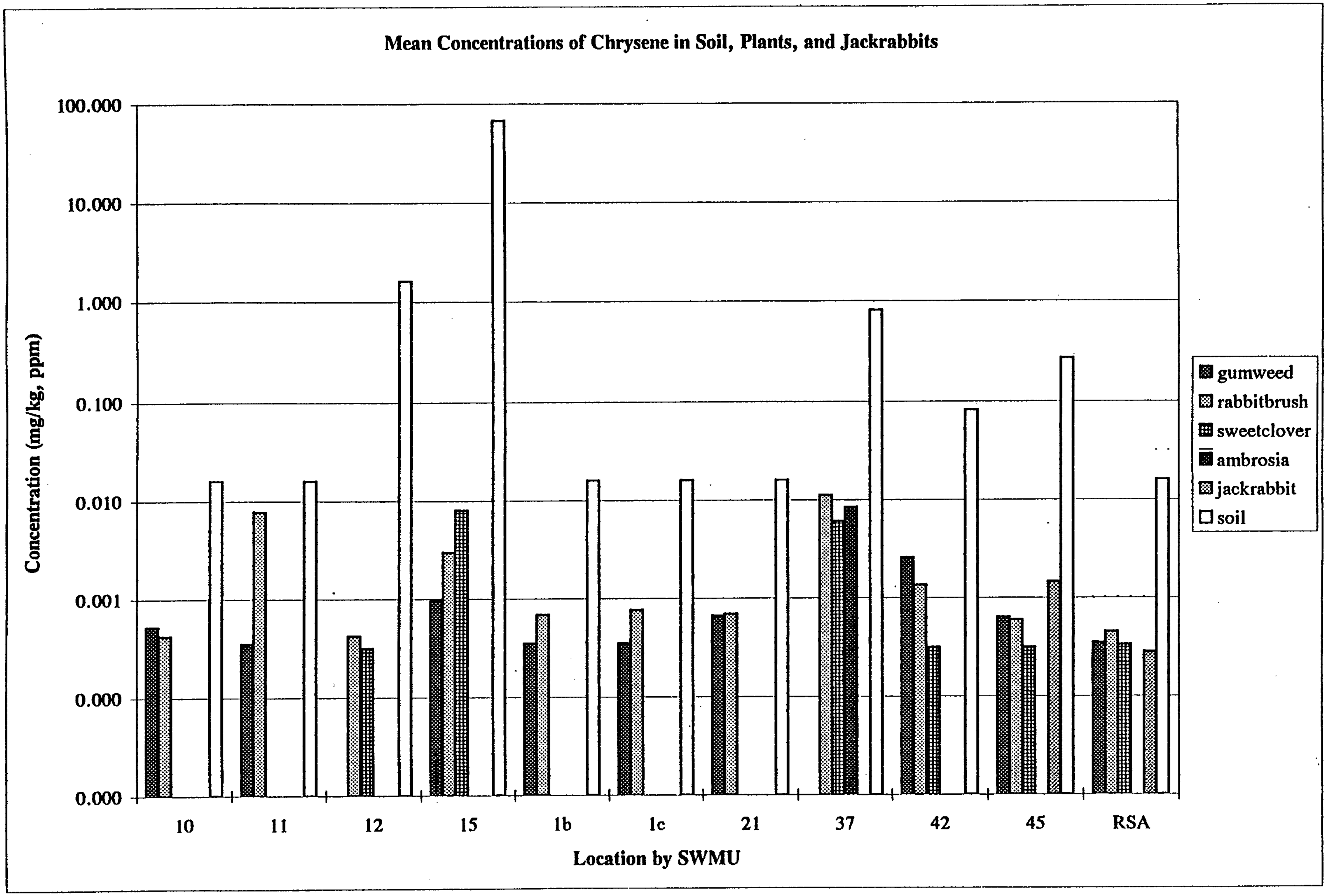

Figure 5-52. Mean Chrysene Concentrations in Soil, Plants, and Jackrabbits - SWMU Basis

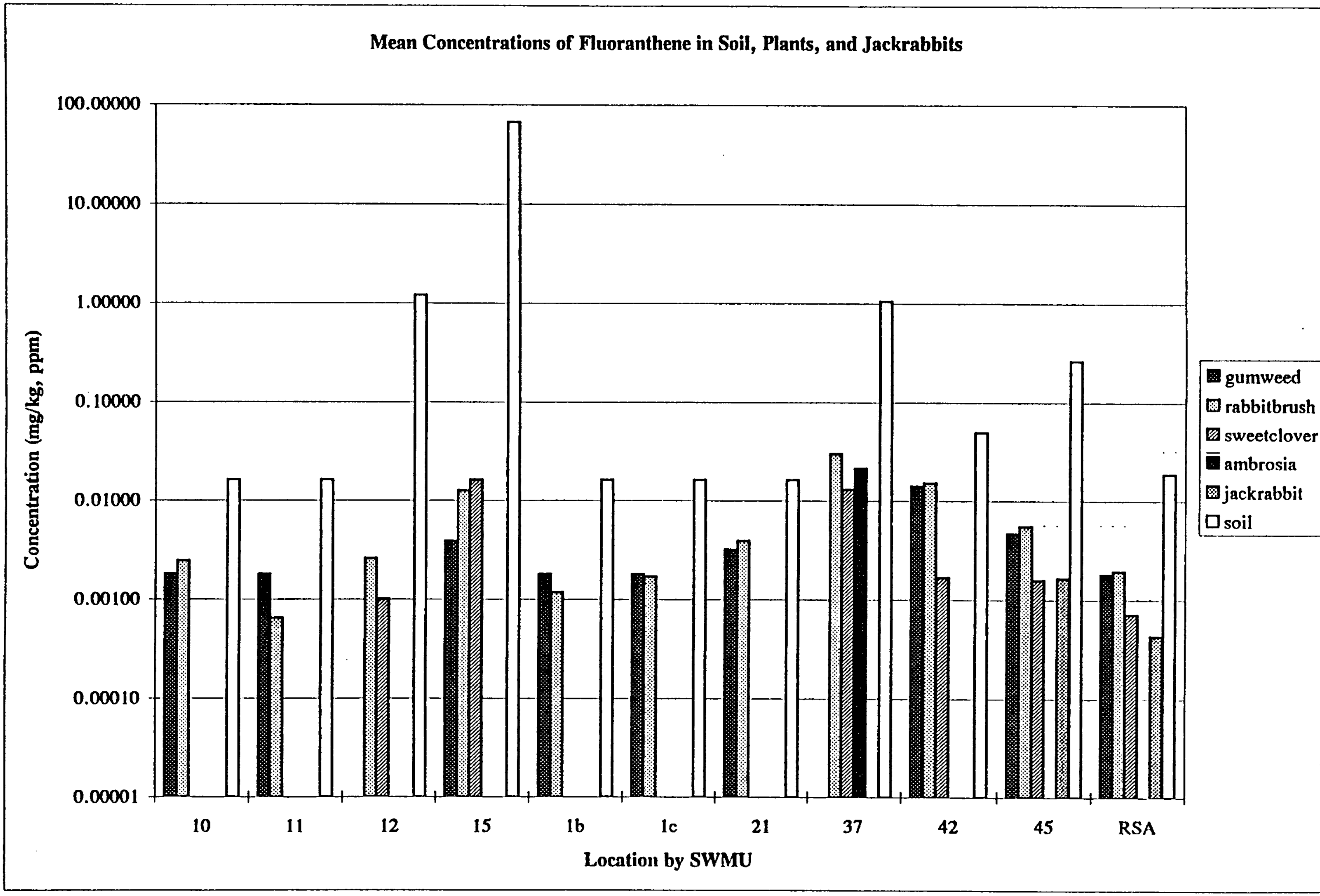

Figure 5-53. Mean Fluoranthene Concentrations in Soil, Plants, and Jackrabbits - SWMU Basis

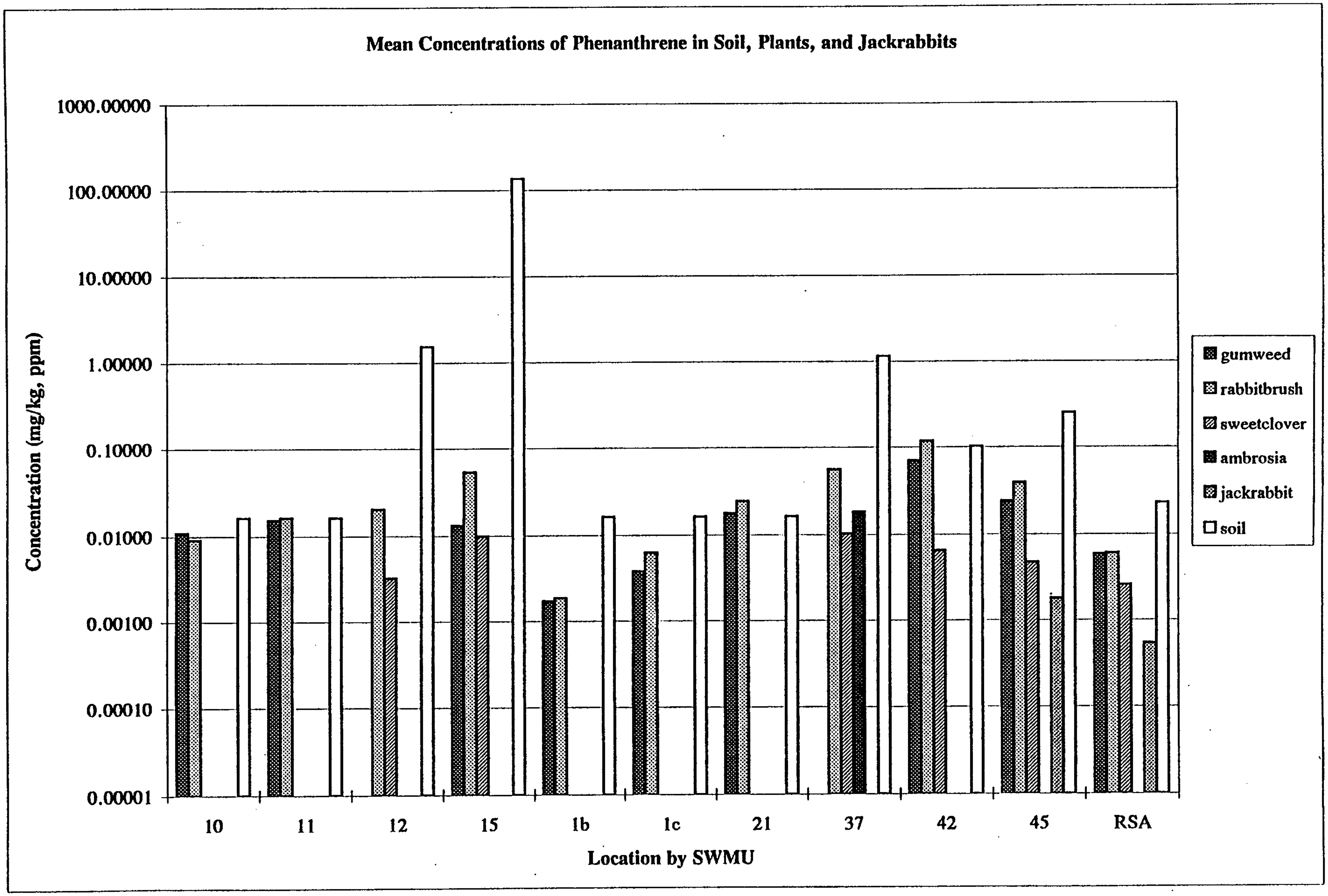

Figure 5-54. Mean Phenanthrene Concentrations in Soil, Plants, and Jackrabbits - SWMU Basis

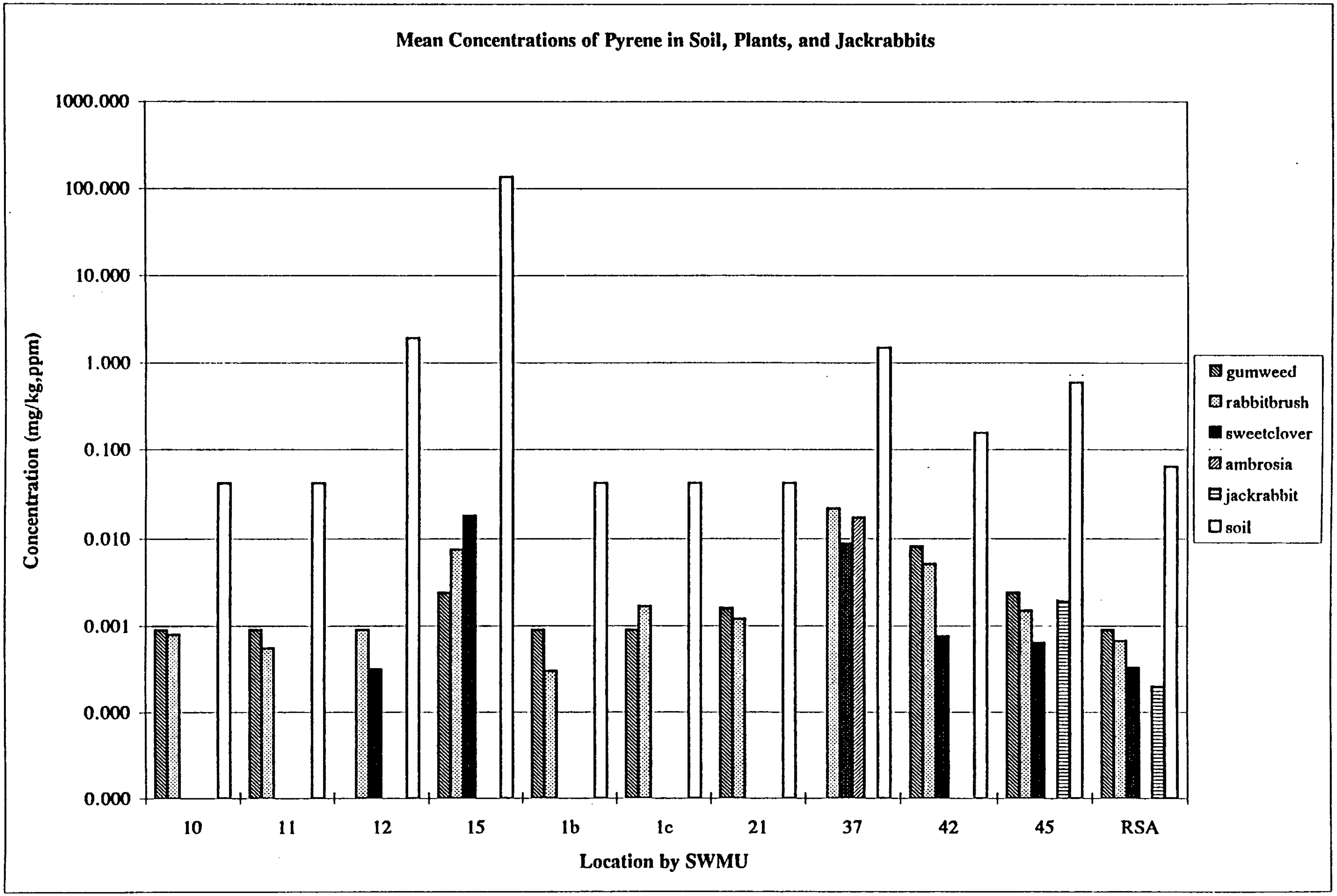

Figure 5-55. Mean Pyrene Concentrations in Soil, Plants, and Jackrabbits - SWMU Basis

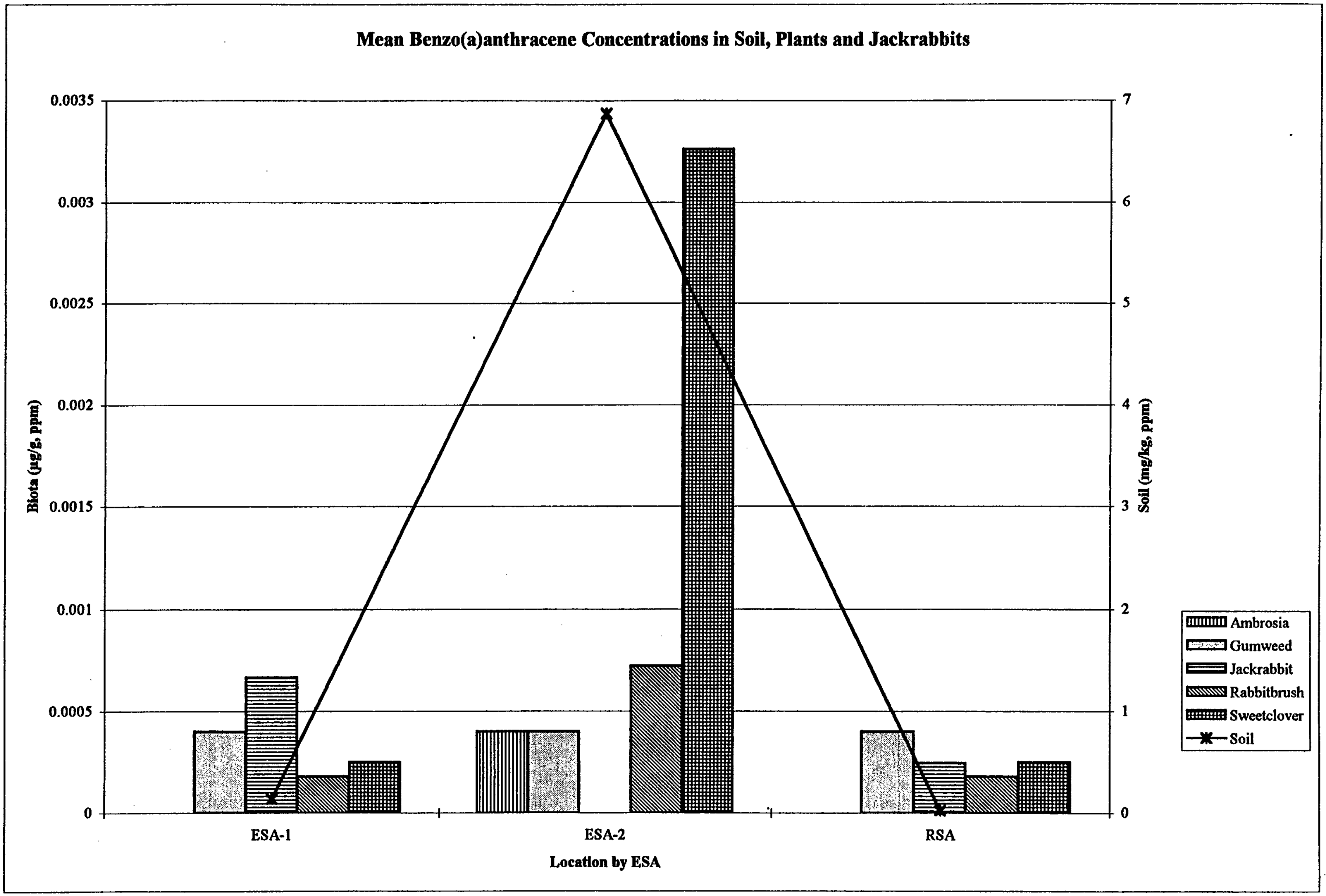

Figure 5-56. Mean Benzo(a)anthracene Concentrations in Soil, Plants, and Jackrabbits - ESA Basis

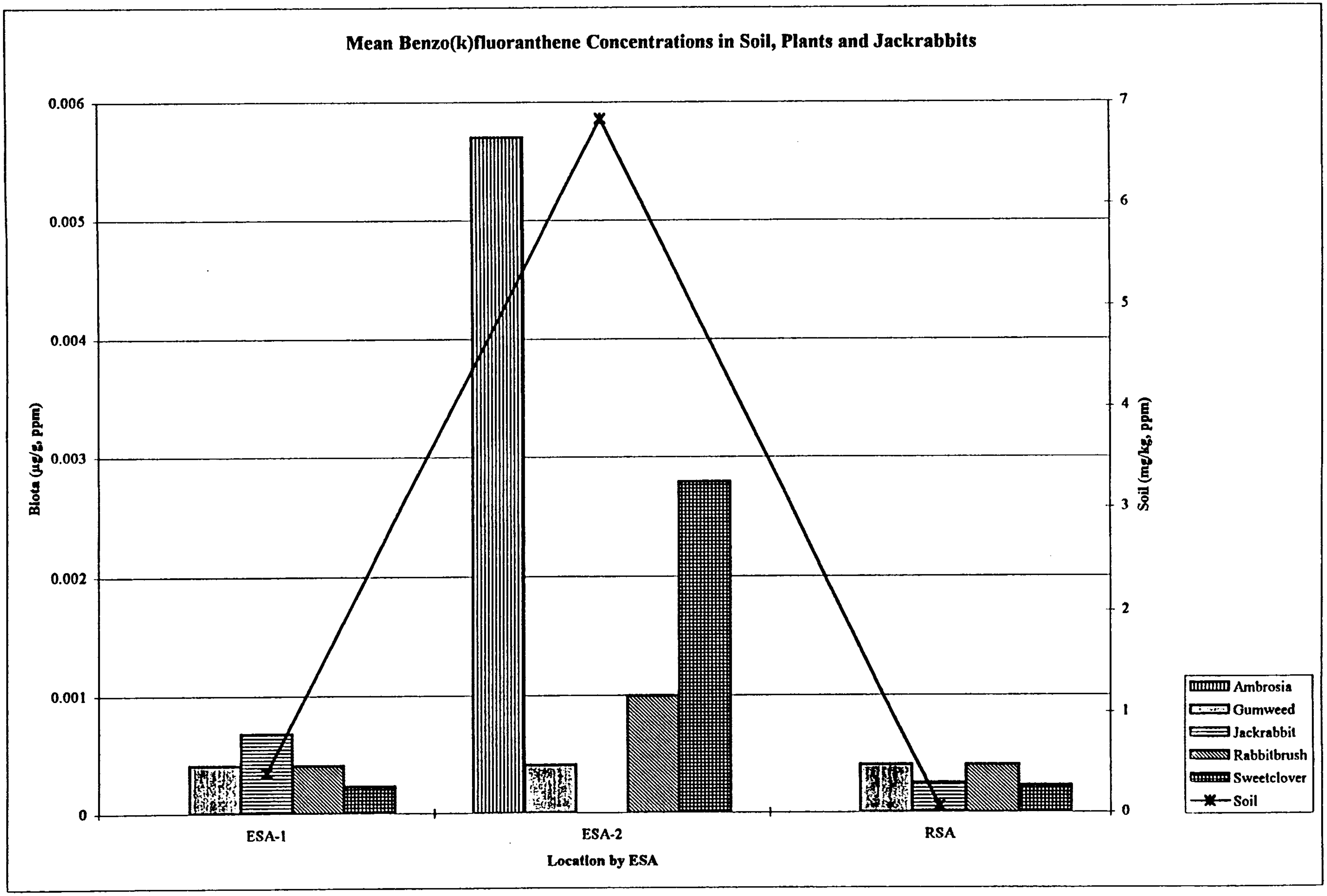

Figure 5-57. Mean Benzo(k)fluoranthene Concentrations in Soil, Plants, and Jackrabbits - ESA Basis

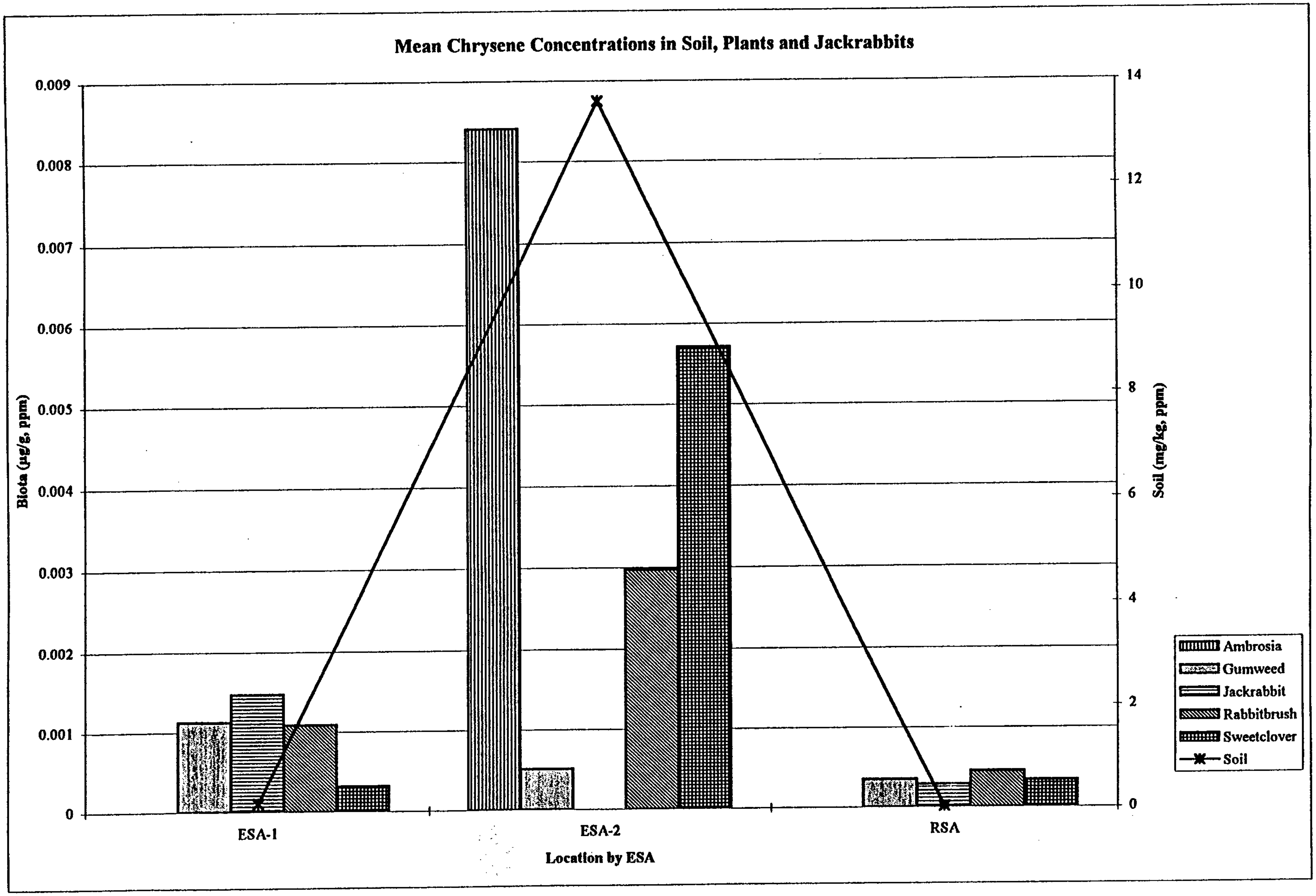

Figure 5-58. Mean Chrysene Concentrations in Soil, Plants, and Jackrabbits - ESA Basis

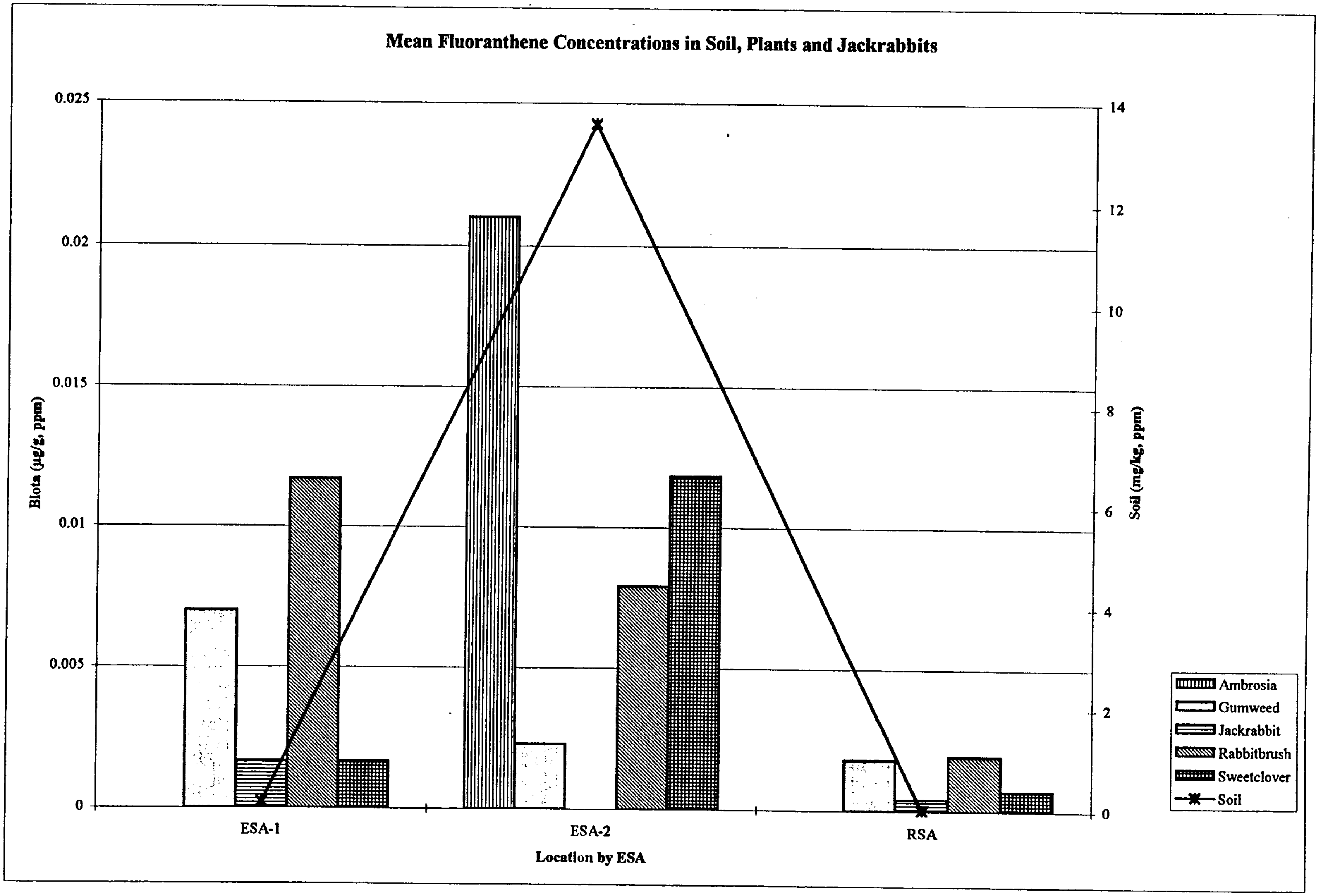

Figure 5-59. Mean Fluoranthene Concentrations in Soil, Plants, and Jackrabbits - ESA Basis

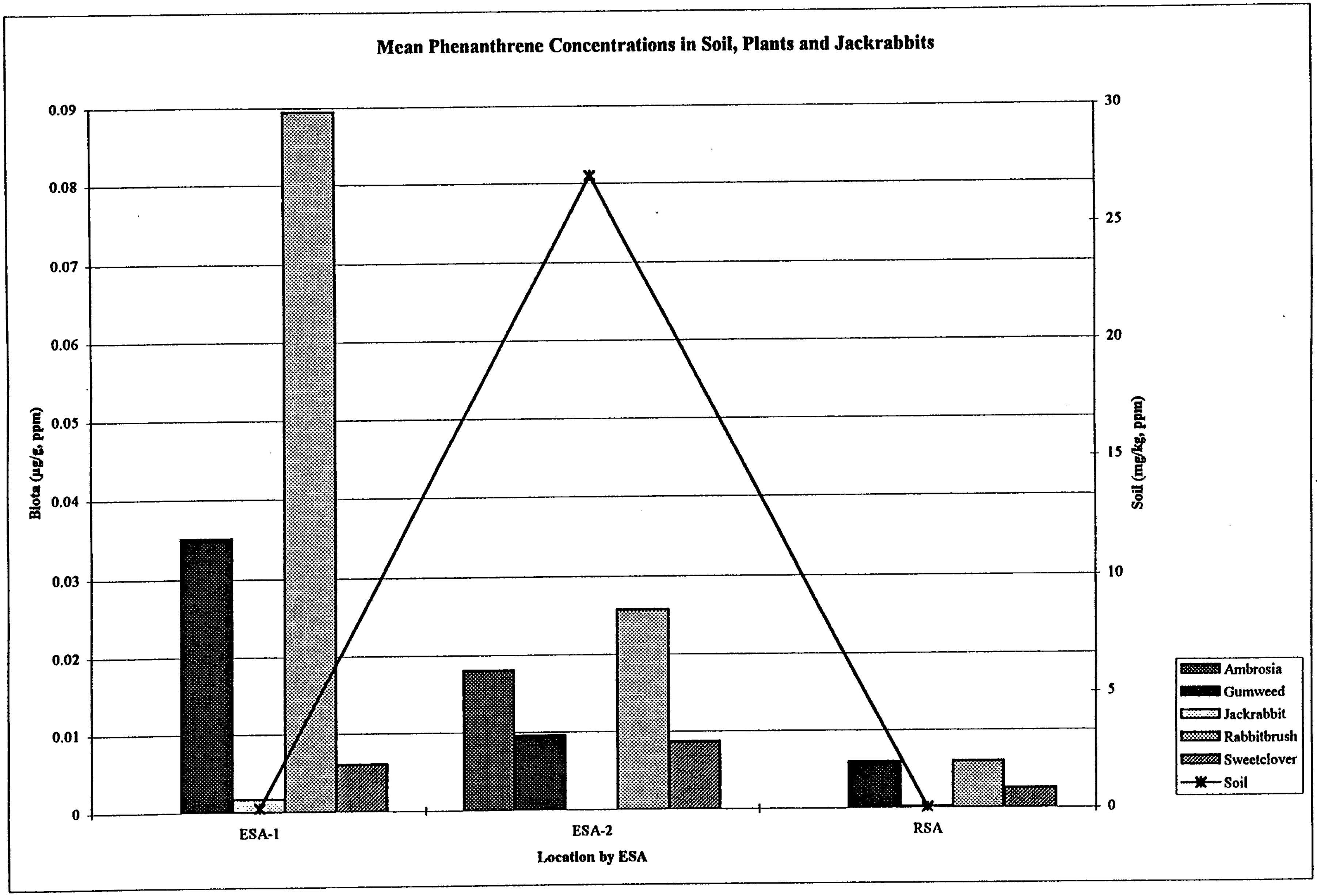

Figure 5-60. Mean Phenanthrene Concentrations in Soil, Plants, and Jackrabbits - ESA Basis

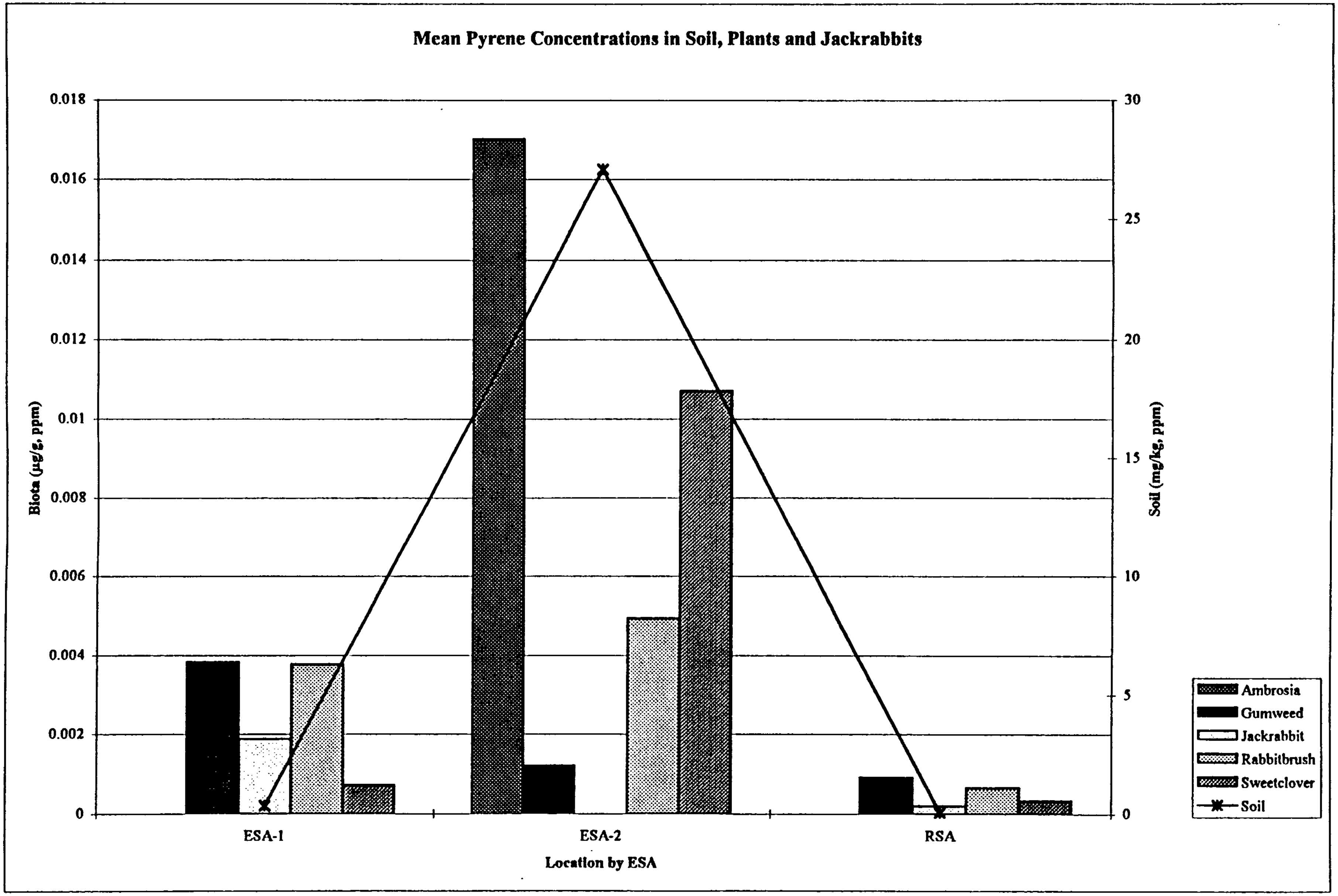

Figure 5-61. Mean Pyrene Concentrations in Soil, Plants, and Jackrabbits - ESA Basis

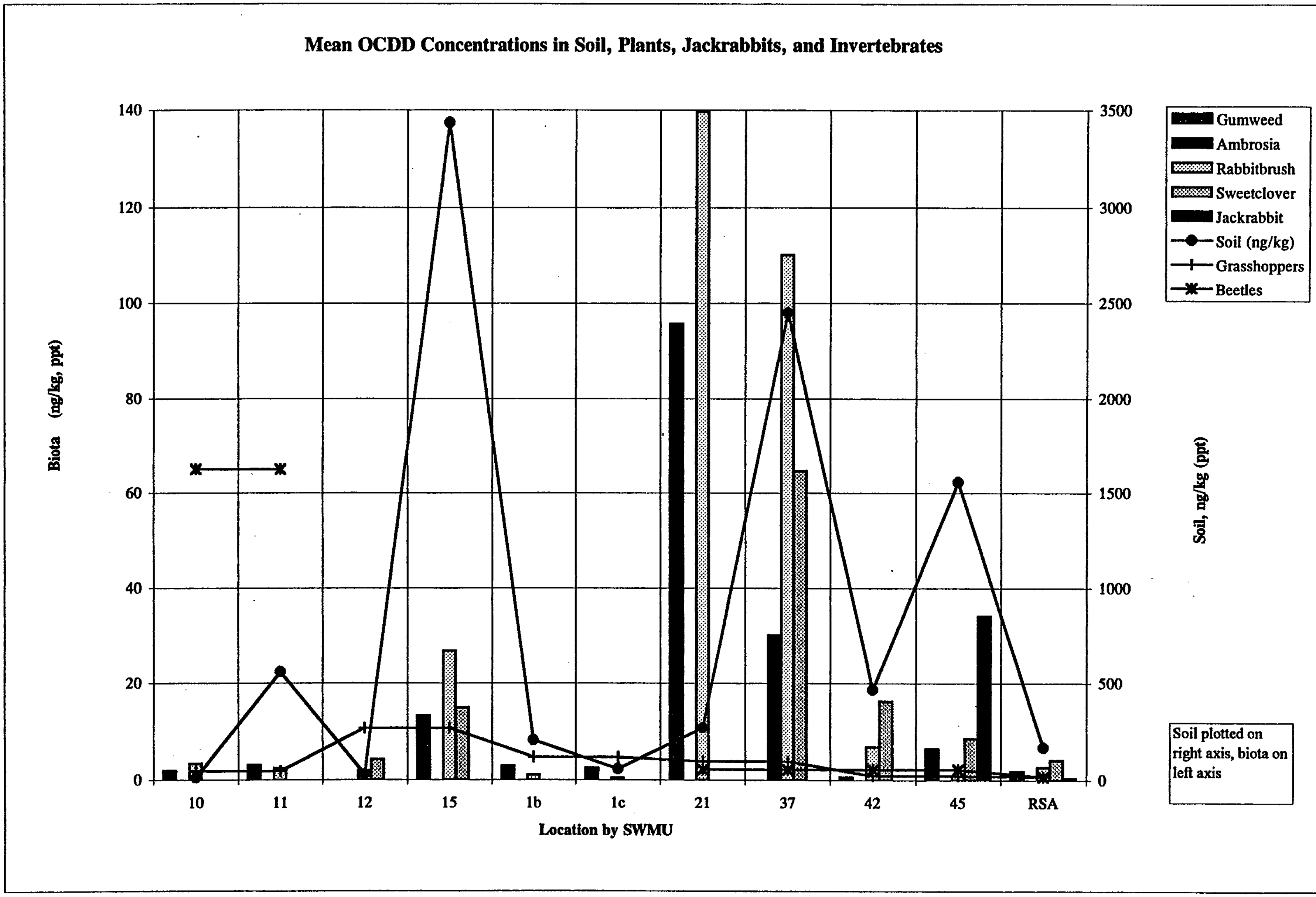

Figure 5-62. Mean OCDD Concentrations in Soil, Plants, Jackrabbits, and Invertebrates - SWMU Basis

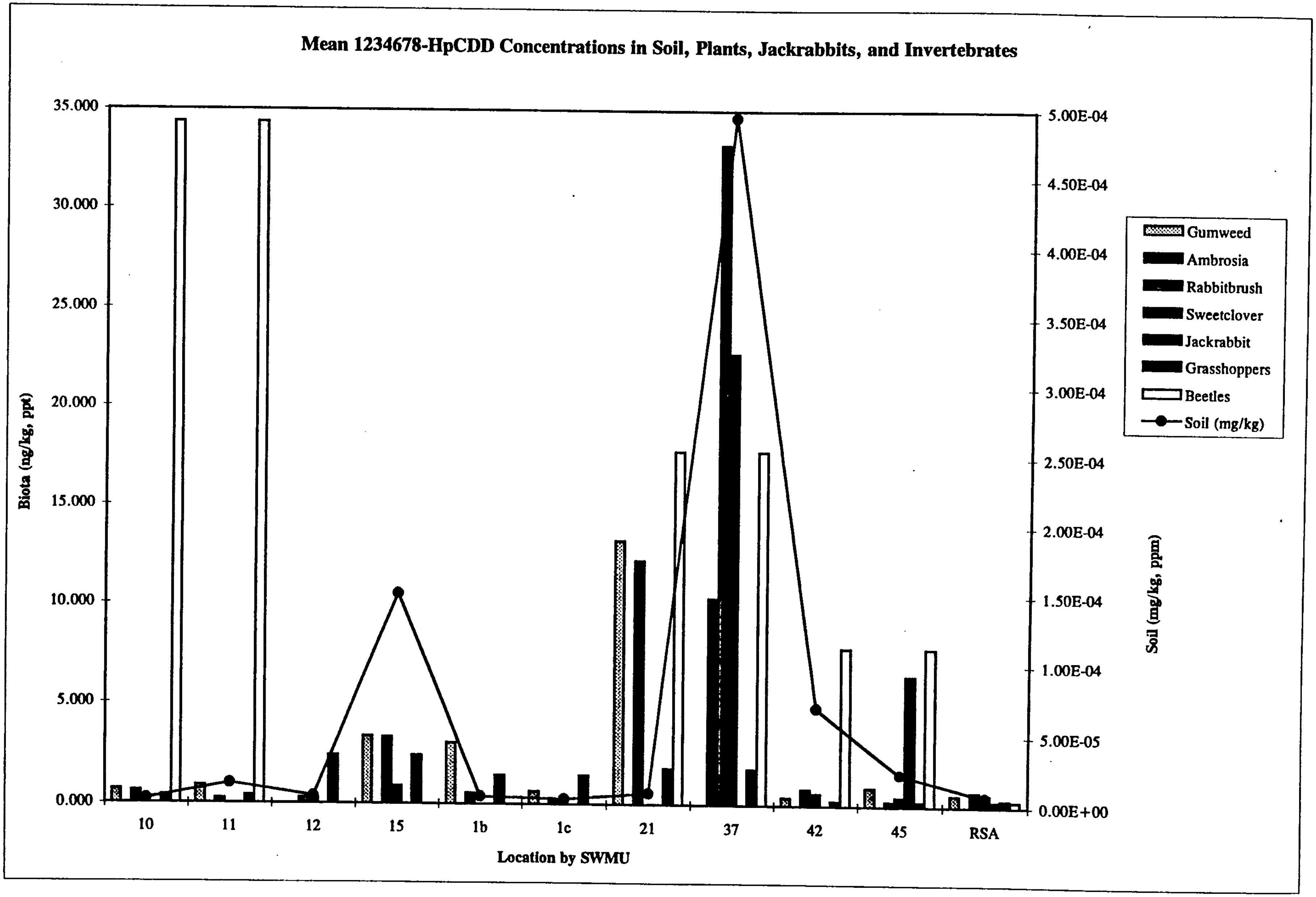

Figure 5-63. Mean 1234678-Heptachlorodibenzodioxin (1234678-HpCDD) Concentrations in Soil, Plants, Jackrabbits, and Invertebrates - SWMU Basis

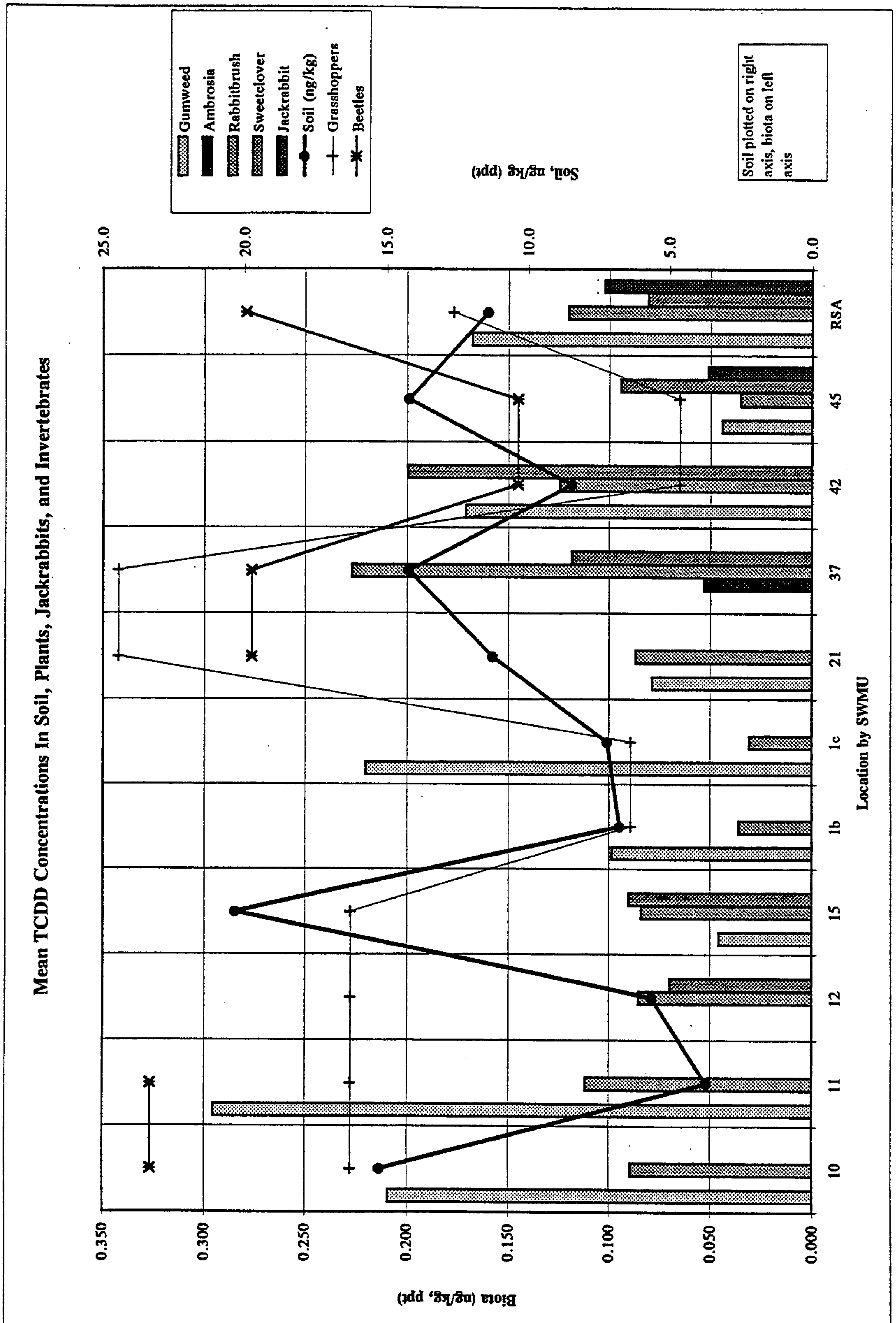

Figure 5-64. Mean TCDD in Soil, Plants, Jackrabbits, and Invertebrates - SWMU Basis

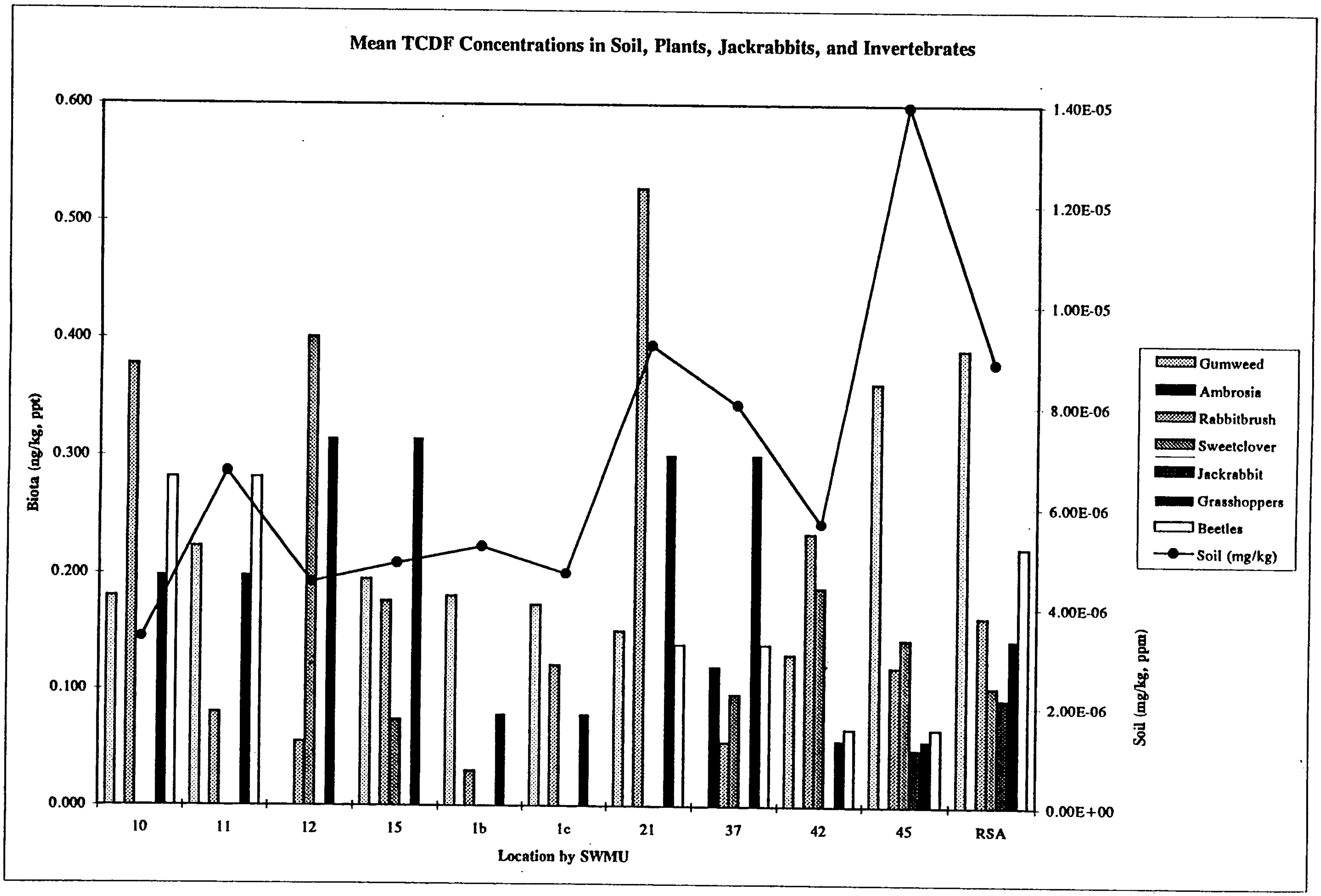

Figure 5-65. Mean TCDF Concentrations in Soil, Plants, Jackrabbits, and Invertebrates - SWMU Basis

apparent in that the data support the biased sampling design; dioxins and furans were detected in both matrices where they were previously detected in soil.

<u>SWMU Basis</u>
The highest contamination occurs at SWMUs 21/37 (AED Deactivation Furnace/Contaminated Waste Processor), which is the likely dioxin source. Other biota detects, especially 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) at SWMU 37 in rabbitbrush, occurred at other SWMUs in lower concentrations as well as at the RSA. The high 2,3,7,8-tetrachlorodibenzofuran (TCDF) detection at SWMU 11 occurred in rabbitbrush, but the soil concentration is similar to other levels at TEAD SWMUs. The only dioxin/furan soil detect at the RSA was OCDD. The soil data for the RSA include all nondetects for all dioxin/furan congeners, except for the one OCDD detect; therefore, the mean OCDD soil concentration was calculated by averaging nondetects and one positive result.

<u>ESA Basis</u>
Values for OCDD and 1,2,3,4,6,7,8-HpCDD show a positive correlation between soil and biota concentrations as shown in Figures 5-66 and 5-67. TCDD and TCDF values show less consistency between soil and biota data across the three ESAs (Figures 5-68 and 5-69).

5.12 COMPARISON OF THE RSA TO TEAD BACKGROUND (INORGANIC SOIL DATA)

All of the records associated with the RSA inorganic soil data were evaluated for frequency of detection and were analyzed using the Shapiro-Wilks test ("W" test) for normality. This process is essentially the same approach discussed in Section 2.2.1 except that, for the duplicate analyses, only the *sample* data record was included (rather than averaging both values). The sample and duplicate analyses in all cases were in close agreement. Analytes that were neither normal nor lognormally distributed were categorized as "Special Case," where the UBC represents the maximum value detected. Table 5-42 provides summary statistics for metals and cyanide for the RSA. The complete RSA surface soil summary statistics are provided in Appendix I.

The data for the inorganic analytes from the RSA were compared to the TEAD background data in order to evaluate the population means for similarity. Both data sets were considered to represent ambient conditions; however, the RSA data were collected "off-post" in contrast to the TEAD data, which were collected from selected TEAD locations presumed to be free from contamination. Because of the spatial proximity, the TEAD background data are likely to more closely reflect ambient conditions at the SWMUs; however, there is a remote chance of site-related contamination. If both data sets are similar, confidence is increased in the assertion that both data sets reflect background conditions.

The TEAD data from Table 2-5 (Section 2.2.1.1) and the RSA data in Table 5-42 were compared by analyte. For TEAD and RSA analytes, where either one of the two data pairs had no detects (i.e., silver, cadmium, cyanide, antimony, selenium, and thallium), no further

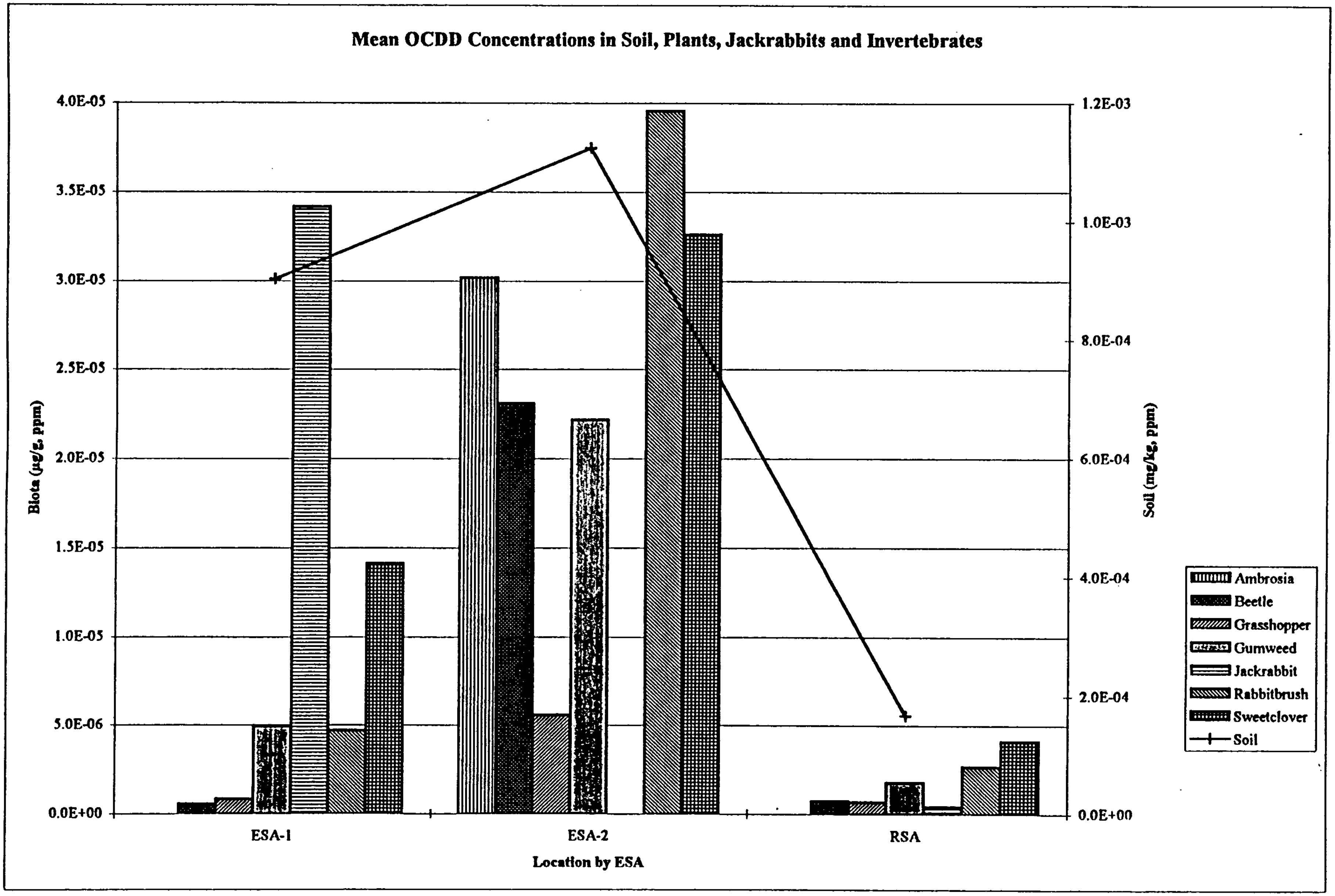

Figure 5-66. Mean OCDD Concentrations in Soil, Plants, Jackrabbits, and Invertebrates - ESA Basis

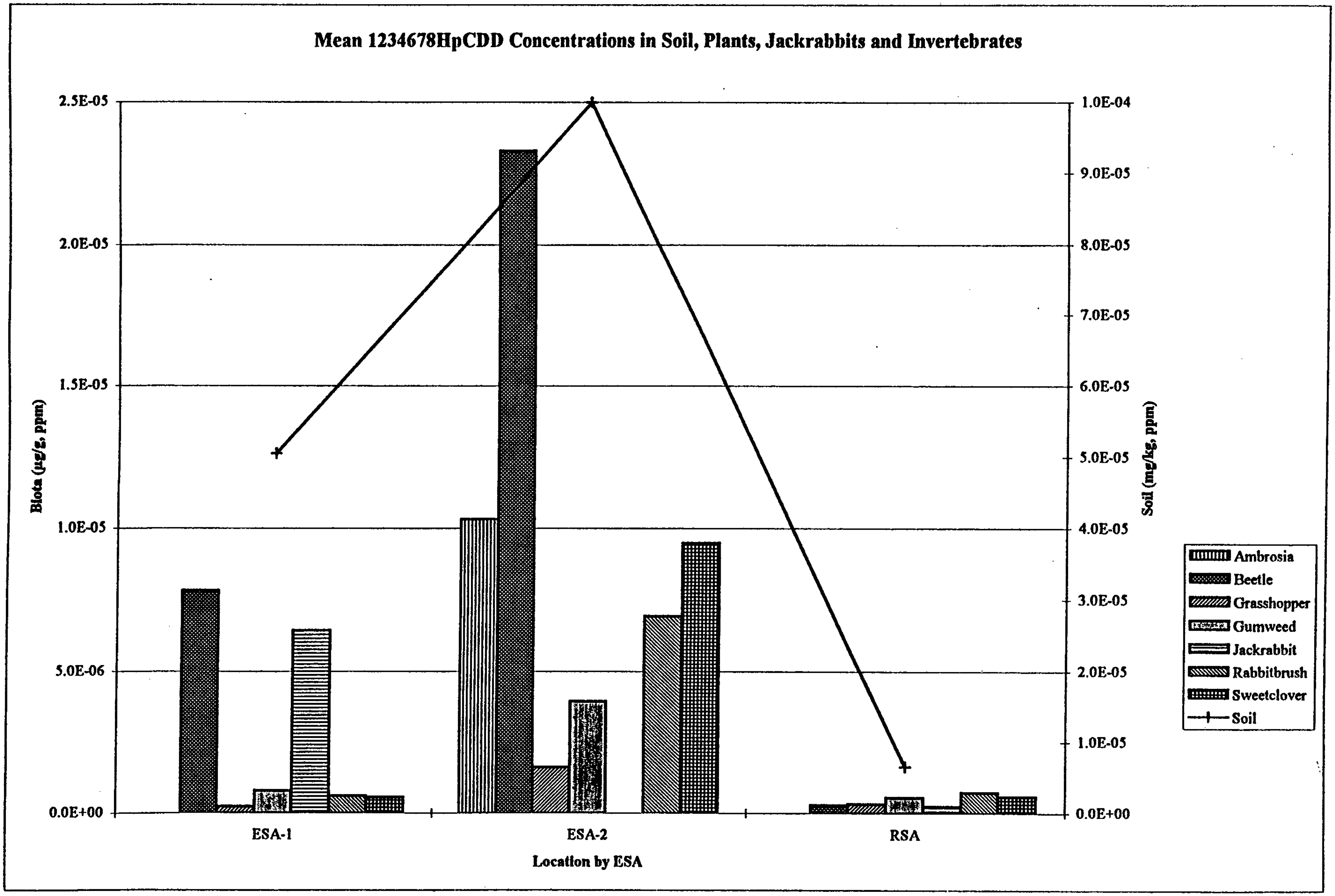

Figure 5-67. Mean 1234678-Heptachlorodibenzodioxin (1234678-HpCDD) Concentrations in Soil, Plants, Jackrabbits, and Invertebrates - ESA Basis

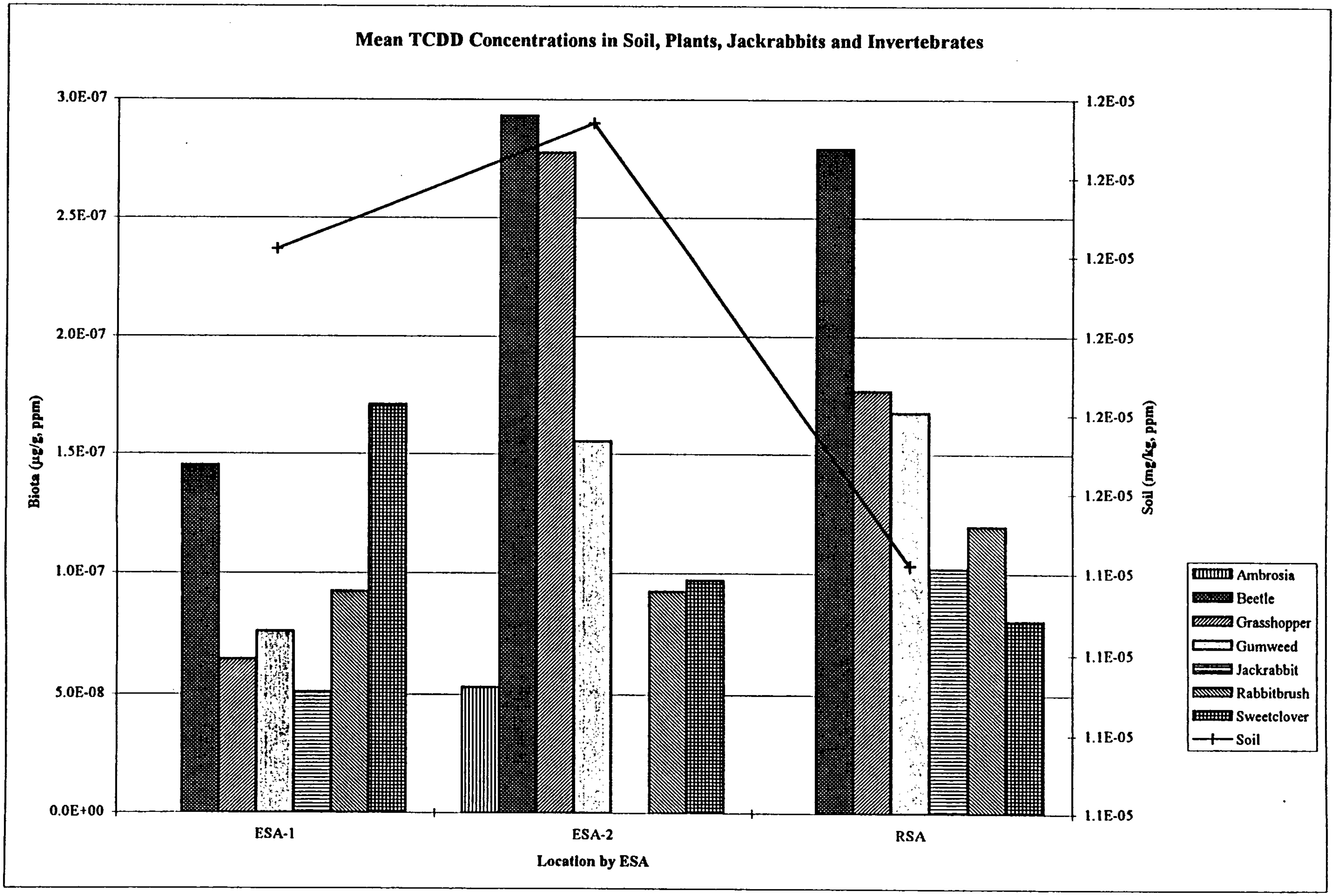

Figure 5-68. Mean TCDD in Soil, Plants, Jackrabbits, and Invertebrates - ESA Basis

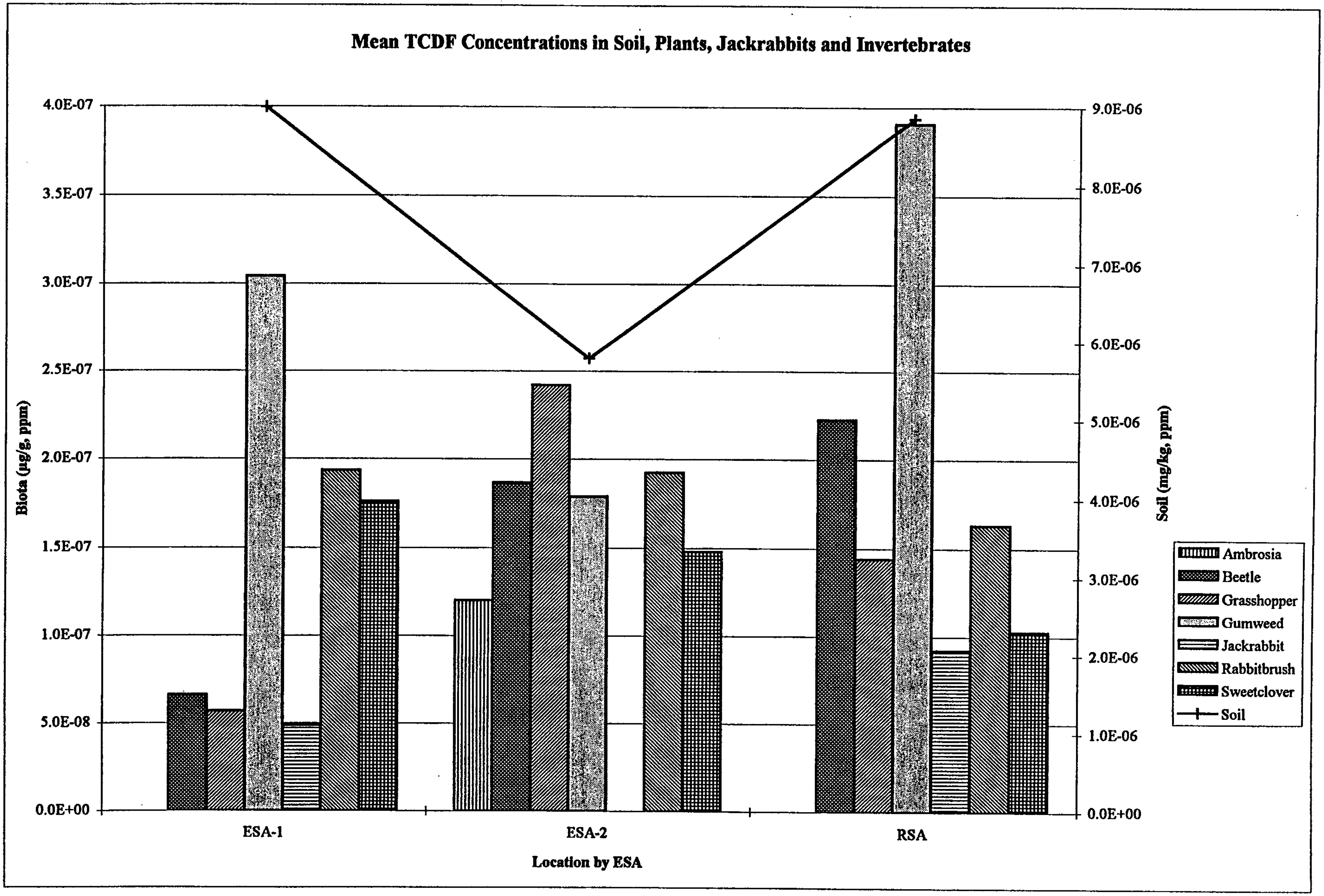

Figure 5-69. Mean TCDF Concentrations in Soil, Plants, Jackrabbits, and Invertebrates - ESA Basis

Table 5-42. RSA Background Data Set - Inorganic Data

Analyte	Number of Detects	Total Number of Samples	Detection Frequency (%)	Minimum Value	Maximum Value	Arithmetic/Geometric Mean (if applicable)	Arithmetic/Geometric Std. Deviation (if applicable)	Upper Bound Concentration	Distribution Type
Silver (AG)	0	16	0	0.803	0.803			0.803	No Detects
Aluminum (AL)	16	16	100	1,180	17,300			17,300	Special Case
Arsenic (AS)	16	16	100	3.99	15.1	7.24	0.81	8.86	Lognormal
Barium (BA)	16	16	100	11.1	134			134	Special Case
Beryllium (BE)	11	16	68.75	0.427	0.823			0.823	< 85% detects
Calcium (CA)	16	16	100	12,800	45,500	27,850	3,849	35,548	Lognormal
Cadmium (CD)	0	16	0	1.2	1.2			1.2	No Detects
Cobalt (CO)	16	16	100	3.23	7.74	5.25	1.37	7.99	Normal
Chromium (CR)	16	16	100	2.09	22.6			22.6	Special Case
Copper (CU)	16	16	100	3.59	39	13.82	1.71	17.24	Lognormal
Cyanide (CYN)	0	16	0	0.25	0.25			0.25	No Detects
Iron (FE)	16	16	100	2,150	17,400			17,400	Special Case
Mercury (HG)	2	16	12.5	0.05	0.0697			0.07	< 85% detects
Potassium (K)	16	16	100	302	6,090	2,089	585	3,259	Lognormal
Magnesium (MG)	16	16	100	1,030	9,960	4,213	1,047	6,311	Lognormal
Manganese (MN)	16	16	100	38	499			499	Special Case
Sodium (NA)	16	16	100	74.3	594	221	30.5	282	Lognormal
Nickel (NI)	16	16	100	2.85	14.8			14.8	Special Case
Lead (PB)	15	16	93.75	7.44	73.3			73.3	Special Case
Antimony (SB)	0	16	0	1	1			1.00	No Detects
Selenium (SE)	0	16	0	0.449	0.449			0.449	No Detects
Thallium (TL)	0	16	0	34.3	34.3			34.3	No Detects
Vanadium (V)	16	16	100	2.32	24.3			24.3	Special Case
Zinc (ZN)	16	16	100	8.32	127			127	Special Case

Note.—All analytes were screened against ≥ 85% detection frequency and evaluated for normality by the Shapiro-Wilks test (W test). For analytes with no detections, the UBC represents the method certified reporting limit (CRL). For 'Special Case' analytes, the maximum detected value was used for the UBC.

Note.—All concentrations are expressed in ug/g, equivalent to ppm.

statistics were applied. Selenium and cyanide were not detected in either data set. For mercury, the UBCs for both TEAD and the RSA were comparable (0.070 ppm and 0.057 ppm, respectively); therefore, no further statistical analysis was performed. Calcium, potassium, sodium, and magnesium are essential nutrients and were not evaluated. Both the TEAD and RSA arsenic data sets exhibited lognormal distributions and were logtransformed prior to statistical analysis. The data sets were evaluated using a one-way analysis of variance (ANOVA with an $\alpha = 0.05$, two-sided, assuming equal sample means) and a Student's t-test (two sample assuming unequal variances). The test results indicated that the two arsenic population means were not significantly different.

The remaining analytes—aluminum, barium, beryllium, chromium, cobalt, copper, iron, manganese, nickel, lead, vanadium, and zinc—were evaluated using the Kruskal-Wallis (KW) and Mann-Whitney (MW) nonparametric tests to determine if the means of the TEAD and RSA analyte populations were significantly different. The results for the KW test are presented below in Table 5-43. Results for the MW test were essentially the same as the KW test and are not shown.

Aluminum, barium, cobalt, manganese, and vanadium distributions at the RSA and TEAD were different, but for the majority of analytes where a comparison of data sets was possible, no statistically significant difference exists between the RSA and TEAD inorganic background data. As a result, both data sets can be considered representative of background conditions with a reasonable level of confidence.

Table 5-43. Nonparametric Evaluation of RSA vs TEAD Inorganic Data

Analyte	KW[a] p-value	Criteria	Conclusion
Aluminum	0.015637	$p<0.05$	*Different*
Barium	0.003569	$p<0.05$	*Different*
Beryllium	0.917558	$p<0.05$	Not Different
Chromium	0.196558	$p<0.05$	Not Different
Cobalt	0.000777	$p<0.05$	*Different*
Copper	0.414207	$p<0.05$	Not Different
Iron	0.079258	$p<0.05$	Not Different
Manganese	0.007314	$p<0.05$	*Different*
Nickel	0.629063	$p<0.05$	Not Different
Lead	0.446295	$p<0.05$	Not Different
Vanadium	0.01427	$p<0.05$	*Different*
Zinc	0.22323	$p<0.05$	Not Different

Note.-H_0: RSA population mean is the same as TEAD population mean (i.e., not different) based upon ranked sum. H_a: RSA population mean is not the same as the TEAD population mean (i.e., different) based upon ranked sum. If p-value < 0.05, then reject H_0, accept H_a; the population means are different. If p-value is greater than or equal to (GE) 0.05, then accept H_0, reject H_a; the population means are not different.

[a]Kruskall-Wallis test.

6.0. RESULTS OF FIELD WILDLIFE AND VEGETATION SURVEYS

6.1 RESULTS OF QUALITATIVE FIELD WILDLIFE AND VEGETATION SURVEYS

6.1.1 CERCLA SWMUs (OUs 4-10)

Site activities occurring at the OU SWMUs listed below are described in Section 1.4 of this report. Locations of these SWMUs are shown in Figure 1-4.

SMWU 31 - Former Transformer Boxing Site—This SWMU is located on Lot 680 in the Maintenance Area. The area is approximately 4 acres in size and has been graded and covered with gravel. Transformers were stored here in the past, but currently vehicles are stored at this lot. Vegetation is sparse and consists primarily of annual species including kochia (*Kochia scoparia*), Russian thistle (*Salsola iberica*), cheatgrass (*Bromus tectorum*), Jim Hill mustard (*Sysimbrium altissimum*), and wild lettuce (*Lactuca scarriola*). There is also evidence that the black-tailed jackrabbit (*Lepus californicus*) uses the area for resting and feeding, particularly on kochia and wild lettuce.

SWMU 32 - PCB Spill Site—Located on Open Storage Lot 665D, this SWMU is approximately 0.1 acre in size and similar in appearance to other open storage areas in the Maintenance Area with the surface graded and covered with gravel. The vegetation is sparse and consists of species such as Russian thistle and Jim Hill mustard. Seedlings of rubber rabbitbrush (*Chrysothamnus nauseosus*) have also become established. Black-tailed jackrabbits occasionally move through this SWMU.

SWMU 35 - Waste Water Spreading Area—Approximately 33 acres in size, this SWMU is located in the southeast corner of TEAD in a broad wash below the former residential complex. The area has a clay-loam soil type and has been seeded to crested wheatgrass (*Agropyron cristatum*) and wild rye (*Secale cereale*), both of which are dominant grass species here. Other vegetation species observed included rubber rabbitbrush, cheatgrass, goatsbeard (*Tragopogon dubius*), Jim Hill mustard, and sand dropseed (*Sporobolus cryptandrus*). Siberian elm (*Ulmus pumila*) and Russian olive (*Eleagnus angustifolia*) have also been planted in a row along the northern portion of this SWMU.

Wildlife was not directly observed at this SWMU, but the habitat appeared suitable for a variety of small- and medium-sized mammals, such as the deer mouse (*Peromyscus maniculatus*), Great Basin pocket mouse (*Perognathus parvus*), valley pocket gopher (*Thomomys bottae*), black-tailed jackrabbit, and desert cottontail (*Sylvilagus auduboni*). Scattered mounds of earth and rabbit pellets under shrubs indicate that the pocket gopher, black-tailed jackrabbit, and mountain cottontail (*Sylvilagus nuttalli*) are present throughout the SWMU. This small- and medium-sized-mammal population could provide a prey base for larger predators and raptors such as the red fox (*Vulpes fulva*), coyote (*Canis latrans*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), and golden eagle (*Aquila chrysaetos*).

SWMU 17 - Former Transformer Storage Area—This SWMU is located in the Maintenance Area, Lot 675 B, and is approximately 2 acres in size. This SWMU has been graded and covered with gravel, and supports a sparse population of Russian thistle and Jim Hill mustard. Seedling rubber rabbitbrush plants were also observed growing at this SWMU. The storage of vehicles in rows provides cover for the black-tailed jackrabbit.

SWMU 33 - PCB Storage Building 659/SWMU 18 - Radioactive Waste Storage Building S-659—SWMUs 33 and 18 are less than 1 acre in size and consist of a large building (S659) on the east side of the Maintenance Area and the surrounding graveled area. Species such as kochia, Russian thistle, Jim Hill mustard, and cheatgrass grow sparsely around the building. To the east of the railroad tracks (approximately 150 feet east of the building), the surface slopes upward toward the DMRO storage site. On this cut slope, the following species were observed: cheatgrass, rubber rabbitbrush, Sandberg's bluegrass (*Poa secunda*), big sagebrush (*Artemisia tridentata*), purple three-awn (*Aristida purpurea*), wild lettuce, yellow sweetclover (*Melilotus officinalis*), curlycup gumweed (*Grindelia squarrosa*), goatsbeard (*Tragopogon dubius*), and Utah milkvetch (*Astragalus utahensis*).

This narrow strip of native and introduced vegetation near the railroad tracks provides habitat for the deer mouse, pocket gopher, black-tailed jackrabbit, and desert cottontail. Pocket gopher mounds are abundant, and both the black-tailed jackrabbit and desert cottontail were observed. In addition, the lark sparrow (*Chondestes grammacus*), house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*), common raven (*Corvus corax*), and American kestrel (*Falco sparverius*) were observed in the area.

SWMU 9 - Drummed Radioactive Waste Storage Area—This 1/4-acre SWMU is located on the northeast side of the TEAD maintenance area. Two concrete pads are the only remaining structures at this former storage location. The surface originally was graded and covered with gravel, but has since been abandoned to natural succession. The dominant vegetation is yellow sweetclover and cheatgrass, both introduced species. Other species include sunflower (*Helianthus annuus*), morning-glory (*Convolvulus arvensis*), storksbill (*Erodium cicutarium*), and goatsbeard. Native perennial species becoming established include rubber rabbitbrush, purple three-awn, sand dropseed, and Sandberg's bluegrass.

This SWMU provides habitat for seed-eating birds such as the lark sparrow and vesper sparrow (*Pooecetes gramineus*), and for both the black-tailed jackrabbit and desert cottontail. Each of these species was observed in and around this SWMU.

SWMU 5 - Pole Transformer PCB Spill—This SWMU is approximately 100 square feet in size and is located in the Ammo Storage Area next to the railroad tracks. A pole-mounted transformer released a quantity of PCBs that contaminated the soils around the pole. The area surrounding this SWMU is a disturbed native grassland with heavy clay soils. Approximately 70 percent of the ground surface is covered by cheatgrass. Other plant species within a 100-foot radius of this SWMU include sand dropseed, Sandberg's bluegrass, matchweed (*Gutierrezia sarothrae*), crested wheatgrass, and Green rabbitbrush (*Chrysothamnus viscidiflorus*). Cover by shrubby species was visually estimated at 10 to 15 percent within the actual spill area.

Pocket gopher mounds, rodent diggings, and rabbit pellets were observed near this SWMU, indicating the presence of a small- and medium-sized-mammal population. Species probably occurring at this SWMU include the deer mouse, Great Basin pocket mouse, Ord's kangaroo rat (*Dipodomys ordii*), western harvest mouse (*Reithrodontomys megalotis*), valley pocket gopher, black-tailed jackrabbit, and desert cottontail. This small- and medium-sized-mammal population also provides the prey base for larger predators and raptors such as the red fox, coyote, American kestrel, red-tailed hawk, northern harrier (*Circus cyaneus*), Swainson's hawk (*Buteo swainsoni*), and golden eagle.

SWMU 6 - Old Burn Area—This SWMU is located near the south-central border of TEAD in a disturbed grassland community. The SWMU is approximately 37 acres in size and consists of trenches and berms that were used to burn scrap metal and trash. Much of the vegetation has been mechanically disturbed by the machinery used to form the trenches and berms that surround this area. The dominant shrub and grass species in the berm areas are rubber rabbitbrush and cheatgrass, respectively. The dominant shrub and grass species in the trench area are matchweed and purple three-awn, respectively. Other species present include big sagebrush, sand dropseed, Indian ricegrass (*Stipa hymenoides*), Sandberg's bluegrass, goatsbeard, gumweed, crested wheatgrass, wild lettuce, western wheatgrass (*Agropyron smithii*), annual sunflower, squirreltail (*Sitanion hystrix*), Utah milkvetch, prickly pear cactus (*Opuntia polyacantha*), globe mallow (*Sphaeralcea coccinea*), and death camus (*Zygadenus venenosus*).

Wildlife observed at this SWMU included the western meadowlark (*Sturnella neglecta*), sage sparrow (*Amphispiza belli*), pinyon jay (*Gymnorhinus cyanocephalus*), and the horned lark (*Eremophila alpestris*). This community provides habitat suitable for a variety of small- and medium-sized mammals, such as the deer mouse, Great Basin pocket mouse, pocket gopher, black-tailed jackrabbit, and desert cottontail. Scattered mounds of earth and rabbit pellets under shrubs indicate that the pocket gopher and black-tailed jackrabbit are present throughout the SWMU. This small- and medium-sized-mammal population also provides the prey base for larger predators and raptors such as the red fox, coyote, American kestrel, red-tailed hawk, Swainson's hawk, and golden eagle.

SWMU 7 - Chemical Range—This SWMU is approximately 82 acres in size and is located approximately 1/2 mile west of SWMU 6 in a disturbed grassland community. The dominant shrub is matchweed, a native species which, when abundant, indicates heavy disturbance to the community, either from overgrazing or mechanical disturbance. At this SWMU, the primary disturbances appear to be both from the machinery used to level the firing range and from cattle grazing in the area. Pockets of big sagebrush also occur here, indicating remnant populations that have escaped major physical disturbance. Although this area has been seeded with crested wheatgrass, the dominant grass is cheatgrass. Sandberg's bluegrass, sand dropseed, and needle and threadgrass (*Stipa comata*) are common. Annual species include storksbill, gumweed, buttercup (*Ranunculus testiculatus*), and Russian thistle.

Pocket gopher mounds, rabbit pellets, and other rodent diggings indicate an active population of small- and medium-sized mammals in this community similar to those described previously.

This small- and medium-sized-mammal population also provides the prey base for larger predators and raptors such as the red fox, coyote, American kestrel, red-tailed hawk, Swainson's hawk, and golden eagle. Bird species observed in the area include the sage sparrow, western meadowlark, horned lark, and western bluebird (*Sialia mexicana*).

SWMU 13 - Tire Disposal Area—The Tire Disposal Area (approximately 0.5 acres) is located approximately 3/4 mile east of SWMU 6 near the south-central border of TEAD. Thousands of tires stored in this large excavation were removed in 1993. The sparse vegetation within the area of the gravel pit consists of species such as Russian thistle, storksbill, and gumweed. The area immediately surrounding the gravel pit is a grassland community similar to that at SWMU 6, and common vegetation species observed included rubber rabbitbrush, cheatgrass, matchweed, purple three-awn, big sagebrush, sand dropseed, Indian ricegrass, Sandberg's bluegrass, goatsbeard, crested wheatgrass, wild lettuce, western wheatgrass, annual sunflower, squirreltail, Utah milkvetch, prickly pear cactus, globe mallow, and death camus. The common wildlife and birds observed were the western meadowlark, sage sparrow, pinyon jay, horned lark, deer mouse, Great Basin pocket mouse, pocket gopher, black-tailed jackrabbit, and desert cottontail.

SWMU 22 - Building 1303 Washout Pond—This SWMU is approximately 0.1 acre in size and is located on a slope above Box Elder Wash in the southwest portion of TEAD. The soils in this area are well-drained sands and gravelly sands. Small areas around the building have been disturbed by machinery. Away from the building, the plant community is dominated by sagebrush and pinyon juniper. Adjacent to the building, the dominant shrubby species include rubber rabbitbrush, little rabbitbrush, and matchweed. Dominant grasses include cheatgrass, purple three-awn, Sandberg's bluegrass, needle and threadgrass, and sand dropseed.

Pocket gopher mounds, rabbit pellets, and other rodent diggings indicate an active population of small- and medium-sized mammals similar to those described previously. This small- and medium-sized-mammal population also provides the prey base for larger predators and raptors such as the red fox, coyote, American kestrel, red-tailed hawk, Swainson's hawk, and golden eagle. Bird species in the area include the sage sparrow, western meadowlark, horned lark, western bluebird, black-billed magpie (*Pica pica*), and pinyon jay.

SWMU 23 - Bomb and Shell Reconditioning Building—This SWMU is located in the upper elevation big sagebrush communities on the western and southwestern areas of TEAD. The SWMU area (approximately 1.3 acres) was graded to accommodate the buildings, and the surface is graveled, barren, or covered with asphalt. Within the SWMU footprint, the dominant species were matchweed, rubber rabbitbrush, catnip (*Nepeta cataria*), and cheatgrass. Estimated ocular cover within this area was approximately 15 to 20 percent for all species combined. The dominant species surrounding the SWMU in the native big sagebrush plant community were big sagebrush, matchweed, cheatgrass, Sandberg's bluegrass, and squirreltail. Vegetation cover here was estimated at approximately 50 percent for big sagebrush and 50 percent for the grasses. The difference in percent cover between the SWMU proper and the area immediately adjacent to it appears to be a result of manmade physical disturbance.

Wildlife expected within this SWMU include the deer mouse, desert cottontail, and black-tailed jackrabbit, as well as western bluebird, house finch, and European starling nesting in the empty buildings. Wildlife in the surrounding areas would be similar to those found or expected at SWMU 22 and include the deer mouse, Great Basin pocket mouse, pocket gopher, coyote, and red fox. Black-tailed jackrabbit and desert cottontail have been observed in the area. In addition, a western fence lizard within the SWMU and a leopard lizard in the big sagebrush community approximately 1/4 mile north of the site were both observed.

SWMU 36 - Old Burn Staging Area—This SWMU is approximately 3 acres in size and is located approximately 1/4 mile north of SWMU 6 in a similar vegetation type. Plant and animal species expected and present at this SWMU would be identical to those at SWMU 6. Plants likely at this SWMU include rubber rabbitbrush, cheatgrass, matchweed, purple three-awn, big sagebrush, sand dropseed, Indian ricegrass, Sandberg's bluegrass, goatsbeard, crested wheatgrass, wild lettuce, western wheatgrass, annual sunflower, squirreltail, Utah milkvetch, prickly pear cactus, globe mallow, and death camus. Western meadowlark, sage sparrow, pinyon jay, desert horned lark, deer mouse, Great Basin pocket mouse, pocket gopher, black-tailed jackrabbit, and desert cottontail would be expected avian and mammal species.

SWMU 8 - Small Arms Firing Range—The Small Arms Firing Range (approximately 2.6 acres) is located in the northwest portion of TEAD in a grassland community, approximately 1-1/4 miles northeast of SWMU 40 (AED Test Range). The SWMU footprint has been disturbed through the use of bulldozers and other dirt-moving machinery. Within this footprint, only annual species occur, such as cheatgrass, kochia, Russian thistle, storksbill, and morning-glory. Vegetation cover was visually estimated at less than 10 percent, which may in part be due to the extensive soil disturbance when leveling the firing range. In addition, the extensive overgrazing of this site by black-tailed jackrabbits is indicated by the grazed condition of the vegetation, and by the abundance of rabbit pellets and fresh rabbit markings. Behind the target setup area, a berm was constructed to catch all bullets and other projected materials. This berm was seeded with the non-native crested wheatgrass. Other species that have successfully become established in this area include rubber rabbitbrush, purple three-awn, cheatgrass, Sandberg's bluegrass, sand dropseed, and big sagebrush.

In addition to the black-tailed jackrabbit, the deer mouse, Great Basin pocket mouse, Ord kangaroo rat, sage sparrow, western meadowlark, desert horned lark, and raptors are also expected to occur at this site. An immature golden eagle was observed feeding on a jackrabbit in an area approximately 400 feet north of this SWMU.

SWMU 40 - AED Test Range—Located in the northwest area of TEAD, this SWMU is approximately 60 acres in size and has been altered by large equipment activity, munitions testing, and overgrazing of cattle. The vegetation type is shrub-grassland and is dominated by the following species: big sagebrush, little rabbitbrush, rubber rabbitbrush, matchweed, cheatgrass, Indian ricegrass, needle and threadgrass, western wheatgrass, purple three-awn, and sand dropseed. A variety of forbs were also present including death camus, storksbill, yellow sweetclover, and goatsbeard.

Wildlife species observed at this SWMU were varied and included the black-tailed jackrabbit, western meadowlark, sage sparrow, common raven, horned lizard, mourning dove, loggerhead shrike (*Lanius ludovicianus*), and side-blotched lizard (*Uta stanburiana*). A large number of grasshoppers were also present, feeding mainly on yellow sweetclover. Earth mounds and abundant rodent diggings within and adjacent to the revetments indicate a large small-mammal population at this SWMU.

SWMU 41 - Box Elder Wash Drum Site—This SWMU is approximately 1 acre in size and is located in the north-central portion of TEAD at the northern side of the Igloo Storage area, along Box Elder Wash. The dominant plant community is black greasewood (*Sarcobatus vermiculatus*), with winterfat (*Eurotia lanata*) present as young seedlings. The grasses were represented by cheatgrass and Sandberg's bluegrass. Peppergrass (*Lepidium montanum*) was the dominant annual forb.

The wildlife species expected at this SWMU are similar to those described for other SWMUs in the area, such as SWMUs 5, 6, 10/11, 7, 8, 36, and 40. Species include the deer mouse, Great Basin pocket mouse, pocket gopher, desert cottontail, and black-tailed jackrabbit. Animal signs indicated that the pocket gopher, cottontail, jackrabbit, and red fox are active and abundant in and around this SWMU. One western whiptail (*Cnemidophorus tigris*) was also observed. The abundant small- and medium-sized-mammal population provides prey species to the raptors that forage over the area. These raptors include the golden eagle, northern harrier, red-tailed hawk, Swainson's hawk, and American kestrel. It is also likely that the great horned owl (*Bubo virginianus*) also hunts in this area.

6.1.2 Known Releases SWMUs

Site activities that have occurred at the known releases SWMUs are described in Section 1.4 of this report. Locations of these SWMUs are shown in Figure 1-2.

SWMU 2 - Former Industrial Wastewater Lagoon—This 8-acre SWMU is located approximately 4,100 feet northwest of the Maintenance Area and 3,000 feet east of the Open Revetment Storage Area. The site has been capped, fenced, and seeded to crested wheatgrass. In addition, other species such as goatsbeard, kochia, annual sunflower, yellow sweetclover, rubber rabbitbrush, matchweed, purple three-awn, cheatgrass, and sand dropseed have become established. This SWMU supports wildlife species similar to those found at SWMUs 35, 8, 6, and 40.

SWMU 3 - Former X-Ray Lagoon—The former X-Ray Lagoon (approximately 0.1 acres) is within the Igloo Storage Area, and has been seeded with crested wheatgrass. In addition, sand dropseed, cheatgrass, and needle and threadgrass are also abundant. The perimeter of the SWMU also supports Russian olive trees, which were planted at one time as windbreak and/or shade. Cattle have grazed the area extensively, and forb species such as yellow sweetclover, storksbill, Russian thistle, and gumweed are also abundant. Although no animals were observed during the site visit, species expected to occur include the deer mouse, western

harvest mouse, pocket mouse, and Ord kangaroo rat. The avifauna and predator population would include the same species as those expected at SWMUs 10/11, which are described below.

SWMU 10 - TNT Washout Facility/SWMU 11 - Laundry Effluent Pond—SWMUs 10 and 11 combined are approximately 10 acres in size and are dominated by a cheatgrass/native bunchgrass community with inclusions of Utah juniper and rubber rabbitbrush. Common species observed at these SWMUs are cheatgrass, needle and threadgrass, Indian ricegrass, sand dropseed, gumweed, yellow sweetclover, annual sunflower, and Russian thistle. The birds observed at this site included the western meadowlark, lark sparrow, loggerhead shrike, and black-billed magpie. The loggerhead shrike and black-billed magpie nest in the Utah juniper trees, which are common around these SWMUs.

The valley pocket gopher is also common here as evidenced by their numerous mounds. The desert cottontail and black-tailed jackrabbit were identified by their pellet groups and characteristic grazing pattern on shrubs. A small herd of mule deer was observed over a 10-day period at these SWMUs. This herd is probably distinct from the small herd observed at SWMUs 42/45.

Predators and raptors identified included the coyote, red fox, great horned owl, Swainson's hawk, and American kestrel. These species are wide ranging and cover large areas in and around the entire TEAD site; however, a great horned owl nest was observed at this location.

SWMU 12 - Pesticide Disposal Area/SWMU 15 - Sanitary Landfill—SWMUs 12 and 15 occupy approximately 130 acres and are dominated by cheatgrass/annual forb communities with inclusions of native bunchgrasses and shrubs. This area is 1/2 mile northwest of SWMU 45, and similar species occur here. The lark sparrow, sage sparrow, and western meadowlark use the grassland and forb community for nesting and foraging. The common raven, American kestrel, and golden eagle were also observed. The common raven is generally a scavenger but will also prey on smaller birds and mammals. The golden eagle was observed perched on a telephone pole and the kestrel on the telephone wire. These three species of scavenger/predator have a wide distribution in and around TEAD.

The valley pocket gopher mounds were common around the grassland perimeters of the capped landfill and active areas. The black-tailed jackrabbit is also common in the area. The desert cottontail, although not observed, was identified from its pellets.

SWMU 24 - Battery Pit—This SWMU consists of approximately 0.2 acre and is located in the Maintenance Area adjacent to Building 507. The SWMU is surrounded by asphalt paving, concrete parking lots, and other buildings. No native habitat exists at this SWMU; however, some weed species have established themselves in paving cracks, along the edges of the building, and on the gravel surface. These species include kochia, cheatgrass, Russian thistle, and storksbill. Wildlife species expected in this area include the European starling, house sparrow, common raven, American kestrel, house mouse, cottontail rabbit, and black-tailed jackrabbit.

SWMU 30 - Old IWL—The Old Industrial Wastewater Lagoons are in an area located approximately 3/4 mile south of SWMU 2 and consists of a large area (approximately 42 acres) where liquid wastes from the maintenance area were discharged. This large area has been heavily grazed and physically disturbed by dirt-moving machinery. The site is now dominated by matchweed, cheatgrass, crested wheatgrass, gumweed, Russian thistle, yellow sweetclover, and storksbill. Some native grasses are becoming established, including Sandberg's bluegrass and purple three-awn. The wildlife, avifauna, raptor, and predator populations expected in this area are similar to those expected at other SWMU's located near the Maintenance Area, such as SWMUs 12/15. Expected species include the deer mouse, harvest mouse, pocket gopher, black-tailed jackrabbit, desert cottontail, horned lark, lark sparrow, sage sparrow, coyote, red fox, golden eagle, red-tailed hawk, Swainson's hawk, and the great-horned owl.

6.1.3 Suspected Releases SWMUs

Site activities that have occurred at the suspected releases SWMUs listed below are described in Section 1.4. Locations of these SWMUs are shown on Figure 1-3.

SWMUs 1b/1c - Burn Pads, Trash Burn Pits—SWMUs 1b and 1c are approximately 1 and 40 acres in size, respectively, are adjacent to one another, and are located near the southwest corner of the TEAD facility, approximately 1/2 mile west of the western edge of the Chemical Range (SWMU 7). The plant community is dominated by cheatgrass and annual forbs such as Russian thistle, bur buttercup, storksbill, gumweed, and annual sunflower. Habitat in this area supports songbirds and small mammals that take advantage of the abundant green forage and seed supply available during and after the growing season. Because this habitat is also open with little vegetation cover, predators and raptors can be abundant on a seasonal basis. Species observed during the September surveys are listed in Table 6-1. Common bird species observed included the western meadowlark, lark sparrow, sage sparrow, and vesper sparrow. Occasional loggerhead shrikes were observed on the periphery of the site where Utah junipers and shrub habitat occur. The meadowlarks, sage sparrows, and vesper sparrows had formed into small flocks at this location, which is common for birds looking for food during the fall months.

The Valley pocket gopher, desert cottontail, and black-tailed jackrabbit were identified from mounds and pellet groups. Their predators include coyote, red fox, and a variety of raptors. A female coyote with young was observed at this group of SWMUs on two mornings. Immature golden eagles were also observed hunting in this area. Because predators and raptors have a large home range, one would expect a number of additional species to occur here as they search for prey species. These include the red-tailed hawk, Swainson's hawk, ferruginous hawk (*Buteo regalis*), great horned owl, red fox, and badger (*Taxidea taxus*).

Table 6-1. Relative Abundance of Wildlife (Qualitative) at TEAD

Species Common/Scientific	Number	Observed/Evidence	Comments on Condition, Habitat, and Abundance
Pooecetes gramineus Vesper sparrow	>10	obs[a]	Abundant, shrubland and grassland.
Melospiza melodia Song sparrow	>10	obs	Abundant, roadside fences.
Passerella iliaca Fox sparrow	>10	obs	Common, weedy roads and perched on fences nearby.
Pipilo chlorurus Green-tailed towhee	1	obs	Not common, single individual in pinyon-juniper.
Chondestes grammacus Lark sparrow	>10	obs	Abundant in annual fields. Many near sweetclover.
Sturnella neglecta Western meadowlark	>10	obs	Abundant in annual fields, grassland, sagebrush.
Amphispiza belli Sage sparrow	>10	obs	Abundant in sagebrush and rabbitbrush.
Geothlypis trichas Common yellowthroat	1	obs	Rare, discharge pond.
Lanius ludovicianus Loggerhead shrike	>10	obs	Common in sagebrush and pinyon-juniper.
Sturnus vulgaris European starling	>10	obs	Abundant, entrance to TEAD[b] and near buildings.
Sialia currucoides Mountain bluebird	>10	obs	Entrance to TEAD, pinyon-juniper. Common
Turdus migratorius American robin	>10	obs	Common, entrance to TEAD.
Salpinctes obsoletus Rock wren	1	obs	Not common, near OB/OD area.
Pica pica Black-billed magpie	>10	obs	Common throughout TEAD.
Gymnorhinus cyanocephalus Pinyon jay	>10	obs	Common in pinyon-juniper.

Table 6-1. Relative Abundance of Wildlife (Qualitative) at TEAD (continued)

Species Common/Scientific	Number	Observed/Evidence	Comments on Condition, Habitat, and Abundance
Corvus corax Common raven	>10	obs	Common throughout TEAD.
Hirundo rustica Barn swallow	>10	obs	Common, ammo area and sewage pond.
Eremophila alpestris Horned lark	>10	obs	Abundant, sagebrush and along roads.
Tyrannus verticalis Western kingbird	>10	obs	Common along fencelines in shrubs.
Zenaida macroura Mourning dove	>10	obs	Common in pinyon-juniper, sagebrush, roadside fences and lines.
Columba livia Rock dove	>10	obs	Common in maintenance area
Bubo virginianus Great horned owl	2	obs	Common in pinyon-juniper and sagebrush.
Falco sparverius American kestrel	9	obs	In all habitats, common.
Pandion haliaetus Osprey	1	obs	Sewage lagoon; rare.
Cathartes aura Turkey vulture	1	obs	Grassland; uncommon.
Aquila chrysaetos Golden eagle	7	obs	Immatures may be repeat observation, 1 adult, 6 immatures.
Buteo jamaicensis Red-tailed hawk	6	obs	Common in sagebrush and pinyon-juniper.
Buteo swainsoni Swainson's hawk	6	obs	Common in sagebrush and pinyon-juniper
Circus cyaneus Northern harrier	5	obs	Common sagebrush and grassland.
Charadrius vociferus Killdeer	5	obs	Common in bare and gravelly areas.

Table 6-1. Relative Abundance of Wildlife (Qualitative) at TEAD (continued)

Species Common/Scientific	Number	Observed/Evidence	Comments on Condition, Habitat, and Abundance
Recurvivostra americana American avocet	3	obs	Sewage lagoon.
Larus californicus California gull	>10	obs	Common, lagoon and landfill
Citellus variegatus Rock squirrel	1	obs	The common entrance to TEAD
Canis latrans Coyote	2	obs	Common.
Vulpes fulva Red fox	—	scat/den	Uncommon, lagoon, ammo area.
Odocoileus hemionus Mule deer	>10	obs	Common in all habitats.
Gambelia wislizenii Leopard lizard	1	obs	Uncommon, sagebrush step.
Sceloporus graciosus Sagebrush lizard	8	obs	Common, sagebrush, grassland.
Cnemidophorus tigris Western Whiptail	2	obs	Uncommon, sagebrush step.
Pituophis melanoleucus Gopher snake	1	obs	Common (probably), pinyon-juniper, sagebrush, and grasslands.

[a]Observed by RE&I team during qualitative survey of 9/27 and 9/28/94.
[b]Tooele Army Depot.

SWMU 4 - Sandblast Area—This SWMU is approximately 0.2 acre in size and is located on the east side of the Maintenance Area. Paved roads, buildings, and graveled surfaces have limited the available habitat for wildlife. Dominant plant species are weedy introduced annuals, and include kochia, cheatgrass, gumweed, Russian thistle, and wild lettuce. Wildlife species expected include European starling, house sparrow, common raven, American kestrel, house mouse, cottontail rabbit, and black-tailed jackrabbit.

SWMU 14 - Sewage Lagoons—SWMU 14 represents the sewage lagoons and occupies approximately 5.9 acres. This SWMU is surrounded by crested wheatgrass planted to reclaim the area after lagoon construction. Native species that have become established at the perimeter of the lagoon include rubber rabbitbrush, sand dropseed, needle and threadgrass, and a wetland species, cattails (*Typha latifolia*).

Wildlife species or sign observed at this site included the black-tailed jackrabbit, desert cottontail, western bluebird, lark sparrow, mallard duck, American avocet, Canada goose, and osprey.

Additionally, at this SWMU, benthic samples were collected using a plastic sampling cup attached to a pole. Invertebrates in the sludges were identified and enumerated. Eight different locations were sampled in the lagoon as shown in Figure 6-1. During the sampling period, a bloom of water fleas (*Cladocera*) was in the water column. Their numbers in each benthic sample were in the hundreds, and no accurate count could be made of these organisms. The other abundant and conspicuous member of this community was the back swimmer (Family *Notonectidae*). These individuals were also seen swimming in the water column.

SWMU 19 - AED Demilitarization Test Facility—Approximately 4.2 acres in size, this SWMU is located in an upper elevation big sagebrush community, approximately 1/2 mile south of SWMU 23. Immediately adjacent to the SWMU, site activities such as the construction of earth bermed revetments have resulted in the removal of native vegetation. Weedy introduced annuals such as cheatgrass, gumweed, Russian thistle, and storksbill have replaced them. As a result, vegetation cover is sparse within the SWMU boundaries; outside of the fenced area the native big sagebrush community dominates. Plant and animal species expected in and around this SWMU are identical to those described above for SWMU 23.

SWMU 20 - AED Deactivation Furnace Site—This site is similar to SWMU 19 described above and consists of approximately 8.6 acres located adjacent to the road between SWMUs 19 and 23. SWMUs 19, 20, 21, 23, and 37 have similar plant and animal species, which include big sagebrush, rubber rabbitbrush, matchweed, Sandberg's bluegrass, cheatgrass, gumweed, annual sunflower, deer mouse, pocket mouse, kangaroo rat, pocket gopher, red fox, coyote, red-tailed hawk, American kestrel, Swainson's hawk, and the great-horned owl.

SWMU 25 - Battery Shop—This SWMU consists of approximately 5.2 acres located in and adjacent to Building 1252 located in the Ammo area. This area is dominated by cheatgrass/ native bunchgrass communities with inclusions of Utah juniper and rubber rabbitbrush. Common vegetation species observed at these SWMUs are cheatgrass, needle and threadgrass,

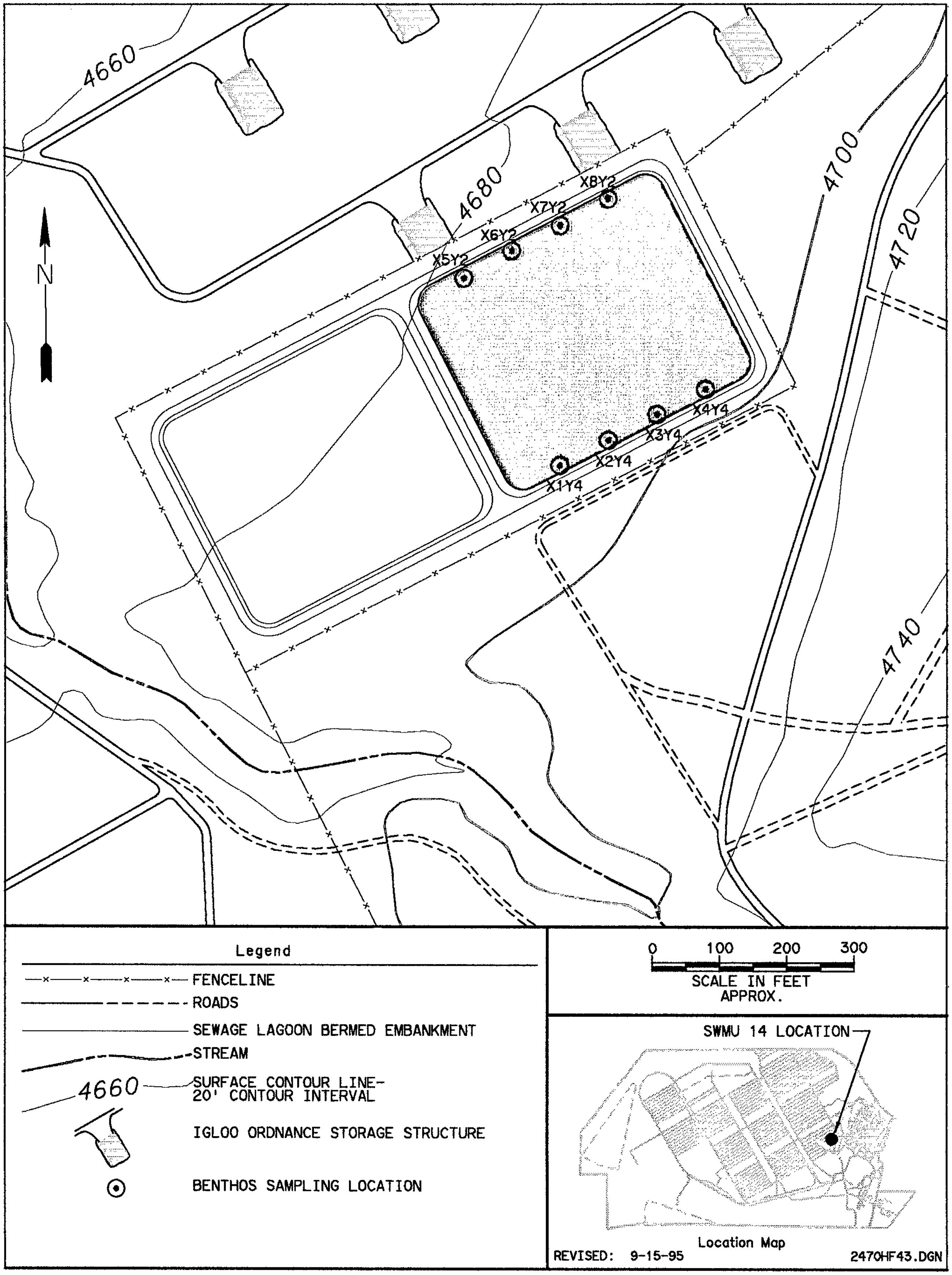

Figure 6-1. Benthic Invertebrate Sample Locations at the Sewage Lagoons (SWMU 14)

Indian ricegrass, sand dropseed, gumweed, Russian thistle, and annual sunflower. The birds observed at this site included the same species observed at SWMUs 10/11: the western meadowlark, lark sparrow, loggerhead shrike, and black-billed magpie.

Pocket gophers and black-tailed jackrabbits are also common here as evidenced by their numerous mounds, pellet groups, and characteristic grazing patterns on shrubs. The herd of mule deer observed at SWMUs 10/11 was also observed at this SWMU. Predators and raptors identified included the coyote, red fox, great-horned owl, Swainson's hawk, and American kestrel.

SWMU 26 - Defense Reutilization and Marketing Office—The DRMO is located on the east side of the Maintenance Area in a large fenced area of about 60 acres where refuse is stored and recycled. Because of the paved access roads, graveled and leveled storage areas, and the presence of stored materials, there is no native habitat in this SWMU. However, this SWMU does provide nesting, cover, and feeding habitat for species that do well around human activity. These species include the black-tailed jackrabbit, desert cottontail, European starling, house sparrow, lark sparrow, deer mouse, and house mouse. The common raven and American kestrel also use the area for foraging. Weedy annual plant species occur sparsely and include Russian thistle, gumweed, annual sunflower, and kochia.

SWMU 27 - RCRA Container Storage Yard—This SWMU consists of approximately 1.3 acres located in the TEAD Administration Area. A single, small building and the adjacent area is surrounded by a chain link fence. Plant species occur sporadically within the SWMU and along the fence. Paved roads and nearby buildings provide little habitat for native species. Species expected at this SWMU would be similar to those described for SWMUs located in the Maintenance Area and include Russian thistle, kochia, gumweed, yellow sweetclover, storksbill, cheatgrass, house mouse, house finch, American kestrel, and the common raven.

SWMU 28 - 90-Day Drum Storage Area—This SWMU is approximately 3.4 acres in size, is also fenced, and is located east of the pesticide disposal/sanitary landfill (SWMUs 12/15) near the southern end of the Maintenance Area. This SWMU supports a sparse population of plant species inside and along the fence because the area has been covered with a gravel surface. Jim Hill mustard, kochia, and Russian thistle occur within the yard and along the fence. Gumweed, cheatgrass, yellow sweetclover, and rubber rabbitbrush were observed growing outside the fence. The SWMU is close to undeveloped land where black-tailed jackrabbits are abundant. The wildlife expected at this SWMU is similar to the fauna described for SWMU 42 and include deer mouse, pocket mouse, pocket gopher, lark sparrow, western meadowlark, and the American kestrel.

SWMU 29 - Drum Storage Area—SWMU 29 is approximately 30 acres in size and is also located near the landfill area (SWMUs 12/15). The ecological description of this SWMU is similar to SWMU 28 above. Additional plant species observed here include matchweed, foxtail barley (*Hordeum jubatum*), Sandberg's bluegrass, Utah milkvetch, needle and threadgrass, and jointed goatgrass (*Aegilops cyclindrica*). Vegetation cover was visually

estimated at approximately 70 percent. The area outside of the SWMU is also periodically mowed. Wildlife species expected here are the same as those discussed for SWMU 42.

SWMUs 21 - Deactivation Furnace Building/SWMU 37 - Contaminated Waste Processing Plant—Located between the ammo area and the chemical range (SWMU 7), these SWMUs together, though they are not contiguous, occupy approximately 1.6 acres. Both SWMUs are dominated by a big sagebrush/native bunchgrass vegetation community with an inclusion of Utah juniper. The area surrounding this SWMU is grazed by cattle.

Common bird species observed included the sage sparrow, lark sparrow, sage sparrow, western meadowlark, loggerhead shrike, and black-billed magpie. One killdeer (*Charadrius vociferus*) had nested and successfully fledged two young near the small stock pond by SWMU 21. The American kestrel was observed on a number of occasions perched on telephone wires. Over the summer, this SWMU was also used by the red-tailed hawk and Swainson's hawk for hunting. The presence of the great-horned owl was confirmed by identification of its castings under Utah juniper trees.

Use of these SWMUs by the mule deer, red fox, and coyote was confirmed by pellet group, scat, or den identification. Numerous coyote scat was also present under Utah juniper trees.

SWMU 42 - Bomb Washout Building—Approximately 72 acres in size, SWMU 42 is a cheatgrass/native bunchgrass vegetation community located near SWMU 45. Dominant vegetation species observed here include cheatgrass, rubber rabbitbrush, yellow sweetclover, Sandberg's bluegrass, bulbous bluegrass, sand dropseed, and gumweed. A small herd of mule deer was observed using this SWMU for grazing. Mule deer observed here move to SWMU 45 for cover in the trees and grass near the stormwater discharge pond. Deer can move large distances, and it is not known how restricted this small herd is to SWMUs 42/45. Very possibly this herd also moves west into the lower elevation grasslands in the ammo area approximately 1/2 mile away.

Wildlife species observed at this SWMU include the black-tailed jackrabbit and the coyote. Mounds of the valley pocket gopher were abundant throughout the SWMU area. Songbirds observed included the western meadowlark and the sage sparrow in the grassland. Along the edges of ravines, the vesper sparrow was abundant, and one western fence lizard was also observed.

SWMU 45 - Wastewater Spreading Area—Approximately 10 acres in size, SWMU 45 is a cheatgrass/native bunchgrass vegetation community near the stormwater discharge pond. In this area, a small wetland has developed, and several large ash trees are well established. Other vegetation species observed at this SWMU included Canada bluegrass, Kentucky bluegrass, common cattail, poison hemlock, rubber rabbitbrush, bulbous bluegrass, cheatgrass, and gumweed. Up to eight deer were observed in and around the stormwater discharge pond. In addition, the black-tailed jackrabbit and valley pocket gopher were also common. The coyote was identified as using the area through the presence of fresh scat. A deer carcass near the discharge pond had been fed upon by coyotes.

Common songbird species included the western meadowlark and sage sparrow. The common raven and golden eagle were also observed at this SWMU. These birds have a large home range and cover a large area of the TEAD site.

Other Suspected Releases SWMUs—The SWMUs listed below are located in the Maintenance and Administration Areas. They are all similar, ranging from less than 0.1 acre up to 2 acres in size, and have plant and animal species in common to those already described for the Maintenance Area (i.e., SWMUs 17, 27, 28, 29, and 33). For the majority of SWMUs, the dominant plant species include kochia, storksbill, gumweed, Jim Hill mustard, Russian thistle, wild lettuce, and cheatgrass. Where buildings and facilities adjoin undeveloped areas, other native species are also present. The most abundant species are rubber rabbitbrush, goatsbeard, Sandberg's bluegrass, sand dropseed, needle and threadgrass, purple three-awn, and matchweed.

The most conspicuous wildlife species within the Maintenance Area is the black-tailed jackrabbit. The open storage areas provide cover and protection. Most jackrabbit predators avoid the active areas within the Maintenance Area because of the high level of human activity, which results in less predation and larger rabbit populations. Yellow sweetclover, kochia, and to some extent gumweed and other annual forbs, provide a ready source of food. Some raptors (including golden eagles and red-tailed hawks) forage along the perimeter of the maintenance area. The American kestrel nests and forages within the Maintenance Area, and it is expected that the great-horned owl also forages in this area. Other species that commonly use the Maintenance Area include the house mouse, deer mouse, pocket gopher, black-billed magpie, lark sparrow, house sparrow, house finch, and European starling.

Below is a list of SWMUs that share habitat characteristics described above:

- SWMU 34 - Pesticide/Herbicide Storage Building
- SWMU 38 - Industrial Wastewater Treatment Plant
- SWMU 39 - Solvent Recovery Facility
- SWMU 43 - Container Storage Area for P999
- SWMU 46 - Used Oil Dumpsters
- SWMU 47 - Boiler Blowdown Areas
- SWMU 48 - Old Dispensary Discharge (Building 400)
- SWMU 49 - Stormwater System/Industrial Wastewater Piping Systems
- SWMU 50 - Compressor Condensate Drain (Building 619)
- SWMU 51 - Chromic Acid/Alodine Drying Beds (Building 623)
- SWMU 52 - Drain Field and Disposal Trenches
- SWMU 53 - PCB Storage/Spill Sites (Buildings 659, 679)
- SWMU 54 - Sandblast Areas (Buildings 603, 604, 612, 613, 637, and 647)
- SWMU 55 - Battery Shop (Building 618)

6.1.4 Reference Study Area

The RSA is a relic big sagebrush community which included five separate study/sampling areas located in an area approximately 10 square miles in size. The area used as representative of the RSA for qualitative assessment purposes was approximately 40 acres in size with an understory of cheatgrass and native bunchgrasses. This qualitative assessment area is shown in Figure 6-2. Proximity to upper elevation vegetation communities provides for the observation of species associated with mountain shrub communities. Species observed at the RSA during September 1994 are listed in Table 6-2. Common songbird species included the western meadowlark, sage sparrow, lark sparrow, loggerhead shrike, mountain bluebird, and the black-billed magpie. Observed raptors were the Swainson's hawk, American kestrel, and golden eagle.

Prey species for raptors and predators included the valley pocket gopher, black-tailed jackrabbit, and desert cottontail. The presence of the valley pocket gopher and desert cottontail were confirmed by identification of gopher mounds and cottontail pellets. The black-tailed jackrabbit was observed in the area. There is a possibility that the mountain cottontail (*Sylvilagus nuttalli*) also occurs at the RSA; however, this was not confirmed during the field surveys. Coyote skat was identified, and diggings characteristic of a badger stalking and hunting for prey were also identified.

6.2 RESULTS OF FIELD WILDLIFE AND VEGETATION QUANTITATIVE SURVEYS

6.2.1 SWMU 42 - Bomb Washout Building/SWMU 45 - Stormwater Discharge

SWMU 42 - Vegetation—Five point-intercept transects were randomly placed at SWMU 42 as shown in Figure 6-3. Species encountered along the transect and their relative dominance, frequency, and importance are shown in Table 6-3. Sixteen species were encountered in the transects. Of these, two were shrubs/half-shrubs, eight were grasses, and six were forbs. Of the 16 species, 10 are natives and 6 are introduced from Europe, Eurasia, or the Mediterranean area.

The dominant species, in terms of relative dominance (31 percent), was cheatgrass, an introduced annual grass. This species is a native of Eurasia and North Africa and was introduced to the United States in the mid-1800s. Because of its early germination, rapid growth, and drought tolerance, cheatgrass can out-compete other native grasses and spreads rapidly. Generally, a prevalence of cheatgrass is recognized as an indicator of overgrazed and disturbed land.

Purple three-awn was the next most dominant species with a relative dominance of 11 percent. This species is a native perennial bunchgrass of the West, and occurs in valleys and foothills on dry sandy to gravelly soils. Purple three-awn grows vigorously in disturbed areas and loses palatability as it matures.

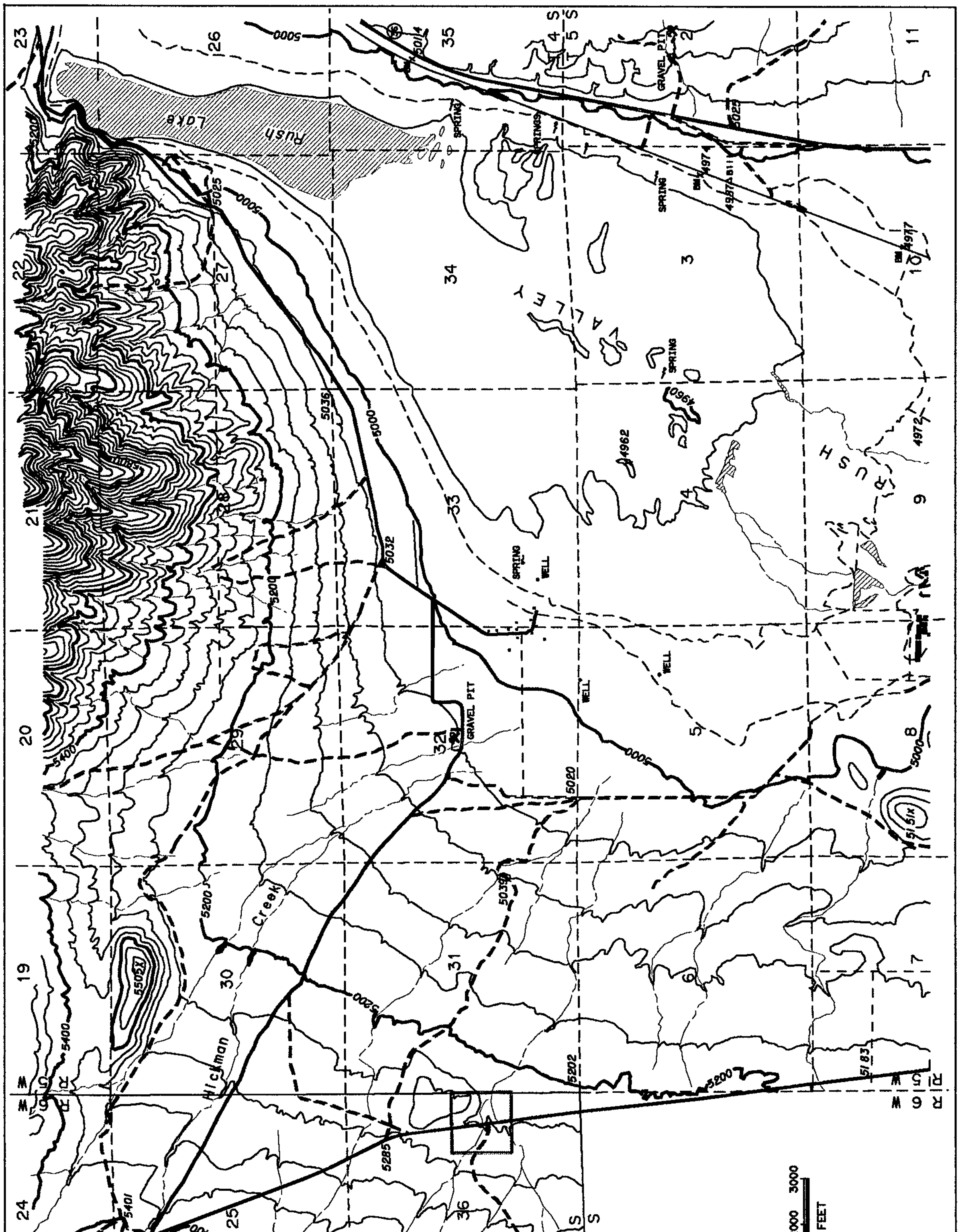

Figure 6-2. Qualitative Assessment Location for the Reference Study Area (RSA)

Table 6-2. Relative Abundance of Wildlife (Qualitative) at the RSA

Species Name Common/Scientific	Number	Observed/Evidence	Comments on Condition, Habitat, and Abundance
Aquila chrysaetos Golden eagle (1 adult, 1 juvenile)	2	obs[a]	1 perched in sagebrush 1 perched in juniper
Circus cyaneus Northern harrier	1	obs	In sagebrush hunting
Bubo virginianus Great-horned owl	1	obs	Flushed from side of road
Falco sparverius American kestrel	3	obs	Perched on junipers
Buteo swainsoni Swainson's hawk	1	obs	On ground in alfalfa field
Corvus corax Common raven	5	obs	Perched on junipers and flying along ground
Eutamias minimus Least chipmunk	2	obs	Fairly abundant in juniper and sage
Amphispiza belli Sage sparrow	abundant	obs	Flushed from sagebrush
Sturnella neglecta Western meadowlark	common	obs	Flocks of 5-10 in juniper and sage
Sialia currucoides Mountain bluebird	common	obs	Single individuals in juniper
Canis latrans Coyote		scat	Old scat, not recent in sage and juniper

[a]Observed.

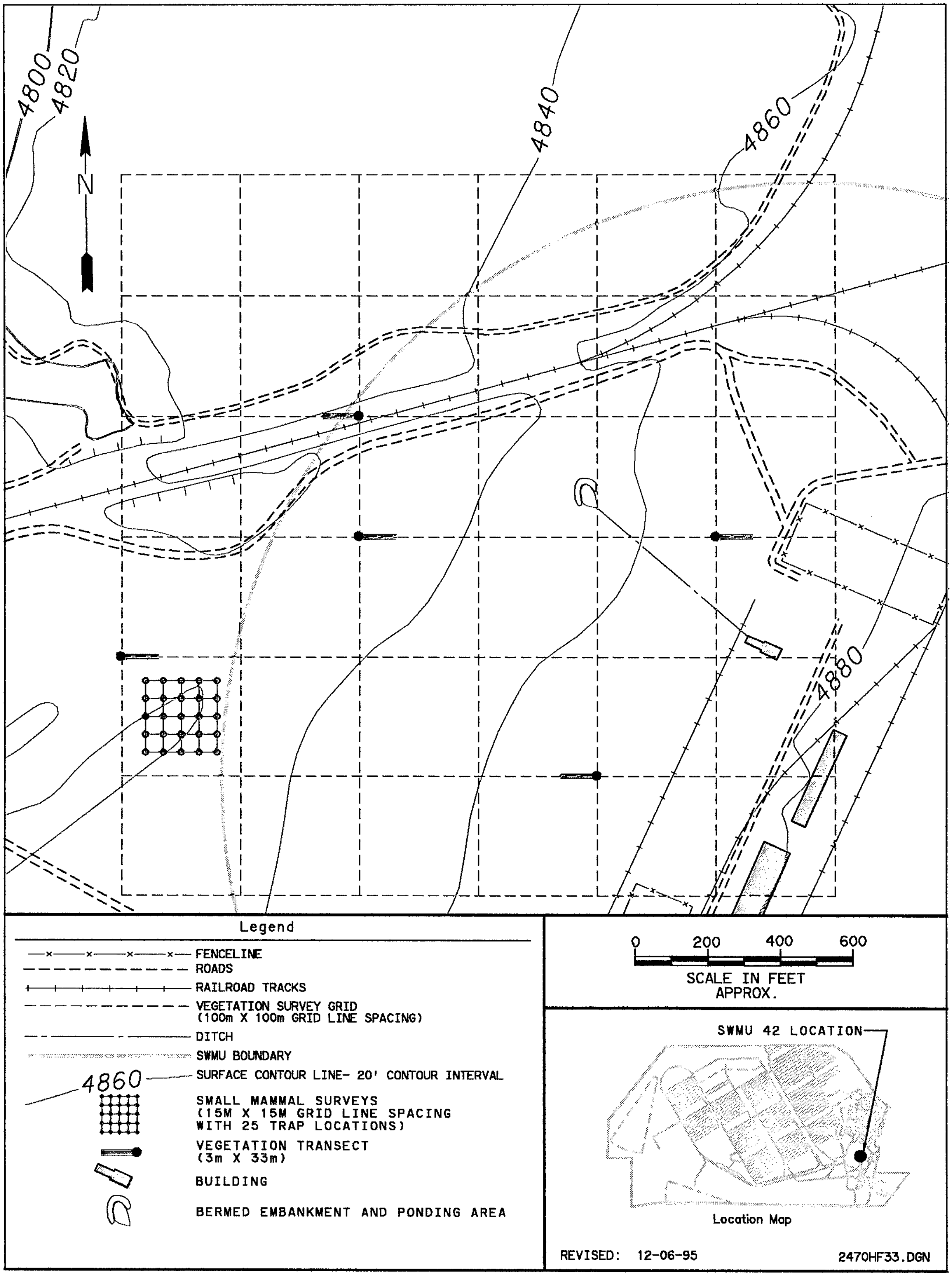

Figure 6-.3 Quantitative Survey Locations for SWMU 42 (Bomb Washout Building)-Vegetation/Small Mammal

Table 6-3. Results of Point-Intercept Transects During Quantitative Vegetation Surveys at SWMU 42 (September 16, 1994)

Species Common/Scientific	Transect #1 (24NE)	Transect #2 (28SE)	Transect #3 (21NW)	Transect #4 (8SE)	Transect #5 (25NW)	Totals
Salsola pesitfer Russian thistle	7	—	—	—	—	7
Aristida purpurea Purple three-awn	2	39	—	—	8	49
Grindelia squarrosa Curlycup gumweed	6	—	4	—	—	10
Chrysothamnus nauseosus Rubber rabbitbrush	4	4	—	—	—	8
Melilotus alba White sweetclover	—	9	—	—	—	9
Stipa comata Needle and threadgrass	1	2	—	—	2	5
Kochia scoparia Summer-cypress; kochia	1	—	—	—	—	1
Bromus tectorum Cheatgrass	—	3	40	85	18	146
Poa secunda Sandberg's bluegrass	—	—	9	—	5	14
Poa fendleriana Muttongrass	—	—	7	—	30	37
Poa bulbosa Bulbous bluegrass	—	3	—	—	—	3
Tragopogon dubius Goatsbeard	—	—	16	—	8	24
Astragalus utahensis Utah milkvetch	—	1	—	—	—	1
Agropyron cristatum Crested wheatgrass	—	—	2	—	—	2
Sporobolus cryptandrus Sand dropseed	—	—	3	—	—	3
Gutierrezia sarothrae Broom snakeweed	—	3	—	—	4	7
Bare ground	—	—	—	—	4	4
Litter	3	29	17	5	23	77
Rock/Asphalt	77	11	—	9	—	97

Muttongrass (*Poa fendleriana*) was the third most dominant species with a relative dominance of 8 percent. This species is also a native perennial bunchgrass on dry sandy to gravelly soils in valleys and foothills. Combined with Sandberg's bluegrass and bulbous bluegrass (*Poa bulbosa*), these three species contributed a total of 12 percent of the relative dominance at this SWMU.

The remaining 11 species contributed 5 percent or less per species to relative dominance. Rubber rabbitbrush is a conspicuous member of this community but, in terms of foliage cover, only contributed 3 percent. An estimate of density for this species is 78 individuals per acre. Matchweed is also a native species that spreads and increases in density in disturbed plant communities. An estimate of density for this species is 203 individuals per acre.

Seasonally, annual forb species also are conspicuous members of this plant community. For example, yellow sweetclover, an introduced species from the Mediterranean area used to improve pastures and provide rapid cover to bare lands, grows rapidly in the spring and summer. Its yellow flowers and spreading habit overshadow lower growing species. However, because yellow sweetclover is an annual, by late summer its earlier dominance is not apparent. This species produces large amounts of small seeds and is an early occupant of disturbed areas.

Based on results of point-intercept transects, SWMU 42 represents a cheatgrass/native bunchgrass community with cheatgrass, purple three-awn, and muttongrass as the dominant species. The high cover value for cheatgrass indicates past community disturbance likely related to overgrazing by cattle.

SWMU 42 - Small Mammals—One small-mammal live-trapping grid was randomly placed at SWMU 42 and operated for 3 consecutive nights as shown in Figure 6-3. Three species of small mammals were trapped over 3 nights at this location. The most abundant small mammal was the deer mouse. Ten males and 3 females were captured a total of 18 times. All individuals were adults, and three were in reproductive condition. Four Great Basin pocket mice and three Western harvest mice also were captured, and individuals from these populations were also in reproductive condition. In a small mammal study in the Uinta Basin in eastern Utah, western harvest mouse populations fluctuated between 0.4 and 3.8 individuals per acre over a 4-year period. The Great Basin pocket mouse densities ranged from 0.4 to 6.7 individuals per acre over this same period. These data suggest that both pocket mouse and Western harvest mouse populations at the time of sampling are at low levels, which are consistent with cycles of seasonal and yearly abundance. Results of the small mammal trapping data are presented in Table 6-4a through 6-4g.

Live trap data suggest that the deer mouse is the dominant small mammal with smaller populations of pocket mice and harvest mice.

The area enclosed by the trapping grid was (60 meters by 60 meters or 3,600 square meters), and the estimated trapping area was 0.9 acre.

Table 6-4a. Results of Small Mammal Live Trapping at SWMUs No. 21/37 (Grid 24), September 13-15, 1994

Species Common/Scientific	Total Captured[a]	Recaptures	Males	Females	Unknown	Avg. Wt.[b]	Adults	Subadults	Juveniles	Repro.[c]	Non-Repro.[d]	Dominance
Peromyscus maniculatus Deer Mouse	33	13	10	9	1	20.9	19	0	0	3	15	1
Dipodomys ordii Ord's Kangaroo Rat	12	2	6	3	1	51.1	9	0	0	0	10	2
Reithrodontomys megalotis Western Harvest Mouse	1	0	0	1	0	15	1	0	0	1	0	3

[a]All small mammals captured in trap, including number of those recaptured one or more times.
[b]Weight in grams.
[c]Reproductive.
[d]Non-reproductive.

Table 6-4b. Results of Small Mammal Live Trapping at SWMU No. 42 (Grid 25), September 13-15, 1994

Species Common/Scientific	Total Captured[a]	Recaptures	Males	Females	Unknown	Avg. Wt.[b]	Adults	Subadults	Juveniles	Repro.[c]	Non-Repro.[d]	Dominance
Peromyscus maniculatus Deer Mouse	18	5	10	3	0	19.5	13	0	0	3	10	1
Perognathus parvus Great Basin Pocket Mouse	5	1	1	2	1	21	2	1	0	1	2	2
Reithrodontomys megalotis Western Harvest Mouse	4	1	3	0	0	12.3	3	0	0	2	1	3

[a]All small mammals captured in trap, including number of those recaptured one or more times.
[b]Weight in grams.
[c]Reproductive.
[d]Non-reproductive.

Table 6-4c. Results of Small Mammal Live Trapping at SWMU No. 45 (Grid 11), September 13-15, 1994

Species Common/Scientific	Total Captured[a]	Recaptures	Males	Females	Unknown	Avg. Wt.[b]	Adults	Subadults	Juveniles	Repro.[c]	Non-Repro.[d]	Dominance
Peromyscus maniculatus Deer Mouse	22	9	6	3	4	16.9	7	2	0	2	7	1
Perognathus parvus Great Basin Pocket Mouse	13	4	2	7	0	22.7	9	0	0	0	9	2
Reithrodontomys megalotis Western Harvest Mouse	3	0	0	1	2	12	0	1	0	0	1	3

[a]All small mammals captured in trap, including number of those recaptured one or more times.
[b]Weight in grams.
[c]Reproductive.
[d]Non-reproductive.

Table 6-4d. Results of Small Mammal Live Trapping at the Reference Study Area, September 27-29, 1994

Species Common/Scientific	Total Captured[a]	Recaptures	Males	Females	Unknown	Avg. Wt.[b]	Adults	Subadults	Juveniles	Repro.[c]	Non-Repro.[d]	Dominance
Peromyscus maniculatus Deer mouse	34	12	14	8	0	19.2	18	4	0	2	20	1
Eutamias minimus Least chipmunk	10	3	5	2	0	35.4	7	0	0	1	6	2
Perognathus parvus Great Basin Pocket Mouse	7	2	1	4	0	20.6	3	2	0	0	5	4
Lagurus curtatus Sagebrush vole	1	0	0	1	0	22	1	0	0	0	1	6
Microtus montanus Mountain vole	7	1	1	5	0	32	6	0	0	0	6	3
Microtus longicaudus Mountain vole	2	0	1	1	0	26	2	0	0	0	2	5

[a]All small mammals captured in trap, including number of those recaptured one or more times.
[b]Weight in grams.
[c]Reproductive.
[d]Non-reproductive.

Table 6-4e. Results of Small Mammal Live Trapping at SWMUs No. 10/11 (Grid 22). September 13-15 1994. TEAD

Species Common/Scientific	Total Captured[a]	Recaptures	Males	Females	Unknown	Avg. Wt.[b]	Adults	Subadults	Juveniles	Repro.[c]	Non-Repro.[d]	Dominance
Peromyscus maniculatus Deer Mouse	15	6	5	4	0	15.1	4	5	0	3	6	1
Reithrodontomys megalotis Western Harvest Mouse	5	2	2	1	0	9	0	3	0	0	3	2
Perognathus parvus Great Basin Pocket Mouse	2	0	1	1	0	15	0	2	0	0	2	3

[a]All small mammals captured in trap, including number of those recaptured one or more times.
[b]Weight in grams.
[c]Reproductive.
[d]Non-reproductive.

Table 6-4f. Results of Small Mammal Live Trapping at SWMUs No. 12/15 (Grid 5), September 17-19, 1994

Species Common/Scientific	Total Captured[a]	Recaptures	Males	Females	Unknown	Avg. Wt.[b]	Adults	Subadults	Juveniles	Repro.[c]	Non-Repro.[d]	Dominance
Peromyscus maniculatus Deer Mouse	23	11	4	8	0	21.8	11	1	0	5	7	1
Perognathus parvus Great Basin Pocket Mouse	2	0	1	1	0	21	2	0	0	0	2	3
Dipodomys ordii Ord's Kangaroo Rat	8	2	3	2	1	45.6	5	0	0	1	4	2

[a]All small mammals captured in trap, including number of those recaptured one or more times.
[b]Weight in grams.
[c]Reproductive.
[d]Non-reproductive.

Table 6-4g. *Results of Small Mammal Live Trapping at SWMUs No. 1b/1c (Grid 36), September 17-19, 1994*

Species Common/Scientific	Total Captured[a]	Recaptures	Males	Females	Unknown	Avg. Wt.[b]	Adults	Subadults	Juvenile	Repro.[c]	Non-Repro.[d]	Dominance
Peromyscus maniculatus Deer mouse	21	12	5	4	0	19.3	9	0	0	1	8	1
Dipodomys ordii Kangaroo rat	12	2	4	5	1	51.3	9	0	0	3	6	2

[a]All small mammals captured in trap, including number of those recaptured one or more times.
[b]Weight in grams.
[c]Reproductive.
[d]Non-reproductive.

SWMU 45 - Vegetation—Five point-intercept transects were randomly placed at SWMU 45 as shown in Figure 6-4. Species encountered along the transect and their relative dominance, frequency, and importance are shown in Table 6-5. As in SWMU 42, 16 total species were encountered in the transects. Of these, two were shrubs/half-shrubs, eight were grasses, and six were forbs. Of the 16 species, 11 are natives and 5 are introduced from Europe, Eurasia, or the Mediterranean area.

Native perennial bunchgrass had a relative dominance of 22 percent. This species occurs in a variety of vegetation and soil types from low elevation valleys to upper elevation alpine situations throughout Utah. It is moderately palatable to herbivores in the early spring and becomes less so as the growing season progresses.

Cheatgrass was the next dominant species with a relative dominance of 15 percent. Crested wheatgrass was the third most dominant species with a relative dominance of 9 percent. Crested wheatgrass is widespread on TEAD and throughout Utah where it has been seeded for soil stabilization purposes in disturbed areas, often along roadways. Crested wheatgrass was introduced from Russia in 1898 for forage and erosion control.

The fourth-ranked species (relative dominance - 7 percent) was matchweed, a native half-shrub of plains, valleys, and lower montane hills. This species has low palatability, and its numbers increase under heavy grazing pressure. The presence of this species indicates past surface soil disturbance and/or overgrazing by cattle.

Percent relative dominance of the remaining 12 species ranged from less than 1 percent to 4 percent, and the combined total percent relative dominance was less than 11 percent. Included in this group of less dominant species was bulbous bluegrass (4 percent), sand dropseed (3 percent), rubber rabbitbrush (2 percent), and nine other species each at 1 percent or less.

Seasonally, annual forb species can be a conspicuous part of this community. Three of these —wild lettuce, goatsbeard, and yellow sweetclover—are species introduced from Europe. Curlycup gumweed is a native annual species that successfully establishes itself in disturbed sites.

Based on results of point-intercept transects, SWMU 45 is a native bunchgrass/cheatgrass community with Sandberg's bluegrass and cheatgrass being the dominant species. The presence of cheatgrass and other early successional species at SWMU 45 indicates past community disturbance.

SWMU 45 - Small Mammals—One small-mammal live-trapping grid was randomly placed at SWMU 45 and operated for 3 consecutive nights as depicted in Figure 6-4. Three species of small mammals were trapped at this SWMU. The most abundant small mammal was the deer mouse. Over the 3-night period, there were 22 total captures of 6 males, only 3 females, and 4 of unknown sex and life history stage. The unknowns were identified only by species because they escaped before being weighed and identified by sex. The most abundant life history stage was the adult.

Nine adult Great Basin pocket mice were captured. Three Western harvest mice, one subadult, and two unknowns were also captured.

6.2.2 SWMU 10 - TNT Washout Facility/SWMU 11 - Laundry Effluent Ponds

SWMUs 10 and 11 - Vegetation—Five point-intercept transects were randomly placed at SWMUs 10/11 as shown in Figure 6-5. Species encountered along the transect and their relative dominance, frequency, and importance are shown in Table 6-6. Fifteen total species were encountered in the transects. Of these, three were shrubs/half-shrubs, eight were grasses, and four were forbs. Of the 15 species, 10 are natives and 5 are introduced from Europe or Eurasia.

Cheatgrass was the dominant species (relative dominance - 31 percent). Native bunchgrass species (stipa) had a relative dominance of 15 percent. This species is found on drier sites, in sandy to gravelly soils, and is highly palatable. Under heavy grazing pressure, it decreases in abundance and vigor, thus, opening up habitat for other species such as cheatgrass.

The third most dominant species was rubber rabbitbrush (8 percent relative dominance). Rubber rabbitbrush is a native shrub that increases in overgrazed plant communities and other physically altered sites. It occurs in deserts, plains, valleys, and foothills throughout Utah and provides forage and habitat to a variety of wildlife species.

The remaining species each contributed 3 percent or less to relative dominance. Annual forb species may not be a conspicuous part of this community since cheatgrass is a dominant species. Cheatgrass can out-compete native annual forbs for available soil moisture in the spring.

Based on results of point-intercept transects, SWMUs 10/11 is a cheatgrass/native bunchgrass community. The higher cover value for cheatgrass at SWMU 10/11 indicates past community disturbance.

SWMUs 10 and 11 - Small Mammals—One small mammal live trapping grid was randomly placed at SWMUs 10/11 and operated for 3 consecutive nights as shown in Figure 6-5. Three species of small mammals were trapped at these SWMUs. The most abundant small mammal was the deer mouse. There were 15 total captures of 5 males and 4 females over the 3-night period. Four adults and five subadults were captured, indicating recent reproductive success at this location.

Three Western harvest mice and two Great Basin pocket mice also were captured, all subadults.

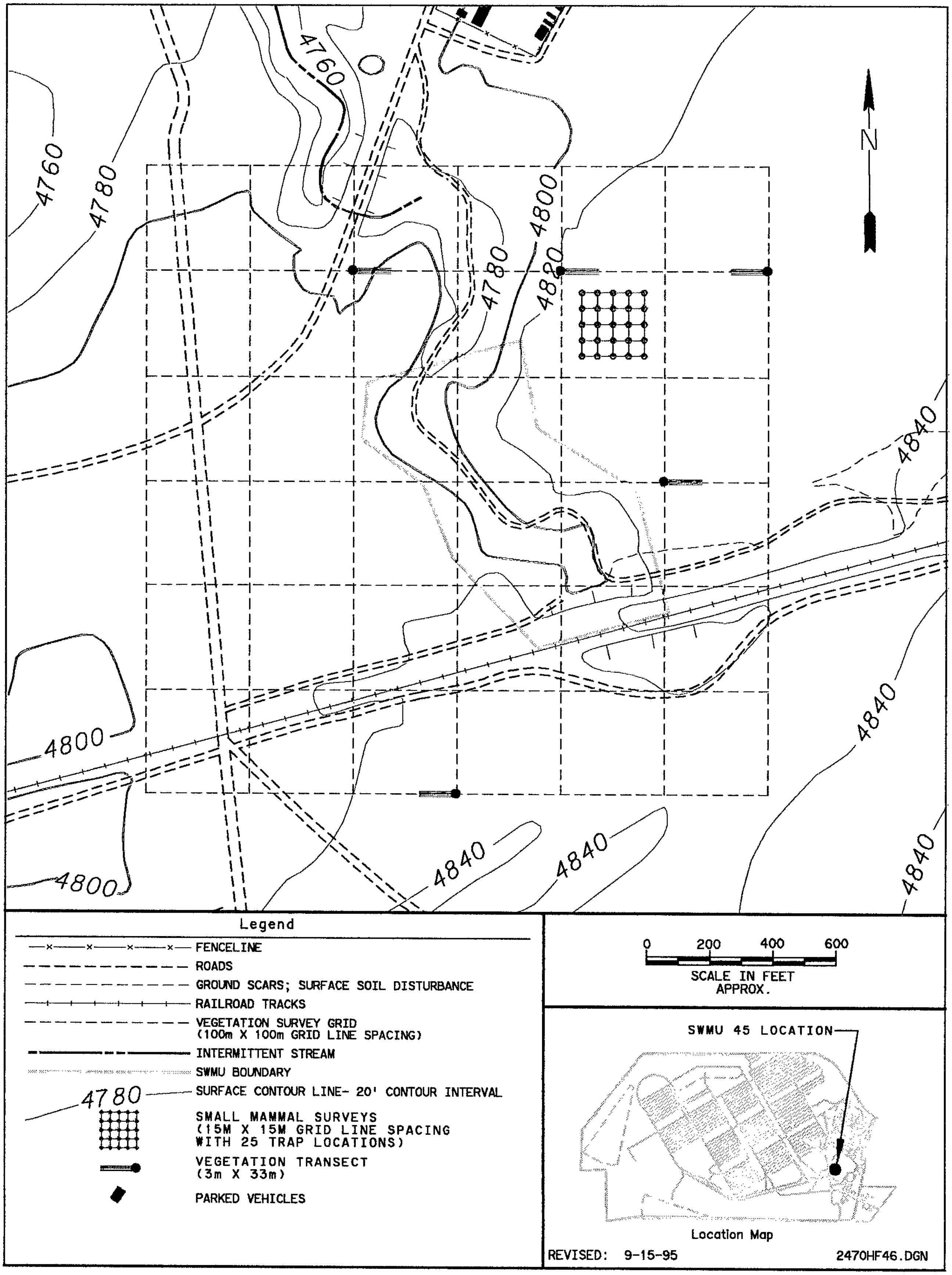

Figure 6-4. Quantitative Survey Locations for SWMU 45 (Stormwater Discharge)-Vegetation/Small Mammal

Table 6-5. Results of Point Intercept Transects During Quantitative Vegetation Surveys at SWMU 45 (September 18, 1994)

Species Common/Scientific	Transect #1 (11NW)	Transect #2 (6SE)	Transect #3 (24NW)	Transect #4 (9NW)	Transect #5 (33SE)	Totals
Poa fendleriana Muttongrass	1	2	1	—	—	4
Poa secunda Sandberg's bluegrass	11	23	33	—	24	91
Poa bulbosa Bulbous bluegrass	8	—	1	10	1	20
Bromus tectorum Cheatgrass	27	23	22	—	4	76
Tragopogon dubius Goatsbeard	—	3	2	—	—	5
Chrysothamnus nauseosus Rubber rabbitbrush	1	—	2	6	—	9
Sitanion hystrix Squirreltail	—	7	—	—	1	8
Gutierrezia sarothrae Broom snakeweed, Matchweed	10	11	12	1	3	37
Lactuca scarriola Prickly lettuce	1	—	—	—	—	1
Sporobolus cryptandrus Sand dropseed	1	2	2	5	1	11
Calicotus nuttallii Sego lily	—	1	—	—	—	1
Zygadenus spp. Deathcamus	—	1	—	—	—	1
Grindelia squarrosa Curlycup gumweed	—	1	4	2	—	7
Melilotus alba White sweetclover	—	—	1	—	—	1
Aristida purpurea Purple three-awn	—	1	4	1	—	6
Agropyron cristatum Crested wheatgrass	—	—	—	46	—	46
Bare ground	7	9	—	10	3	29
Litter	30	19	26	11	22	108
Rock	4	—	—	1	—	5
Asphalt	—	—	50	—	—	50

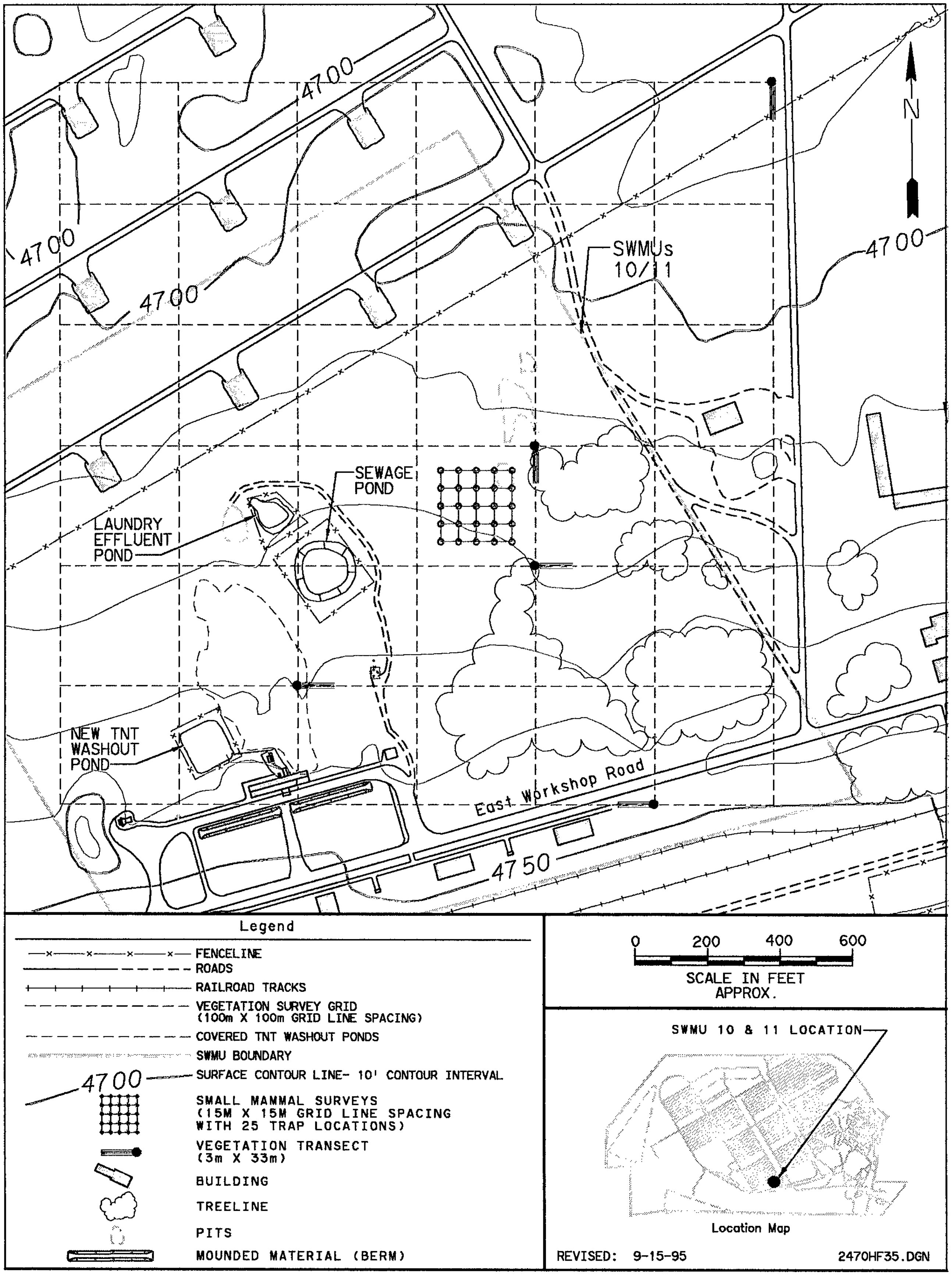

Figure 6-5. Quantitative Survey Locations for SWMUs 10/11 (TNT Washout Facility/Laundry Effluent Ponds) - Vegetation/Small Mammal

Table 6-6. Results of Point Intercept Transects During Quantitative Vegetation Surveys at SWMUs 10/11 (September 18, 1994)

Species Common/Scientific	Transect #1 (22NE)	Transect #2 (29NW)	Transect #3 (6NE)	Transect #4 (35SE)	Transect #5 (33NW)	Totals
Bromus tectorum Cheatgrass	40	29	36	8	36	149
Stipa comata Needle and threadgrass	17	24	14	1	3	59
Sporobolus cryptandrus Sand dropseed	2	—	—	—	—	2
Chrysothamnus nauseosus Rubber rabbitbrush	7	14	13	1	—	35
Chrysothamnus viscidiflorus Green rabbitbrush	3	—	—	—	—	3
Elymus smithii Smith's wild rye	—	—	8	—	—	8
Gutierrezia sarothrae Broom snakeweed	—	—	1	—	—	1
Grindelia squarrosa Curlycup gumweed	—	—	—	1	—	1
Stipa hymenoides Indian ricegrass	—	—	2	—	2	4
Sitanion hystrix Squirreltail	—	—	8	—	—	8
Psoralea spp. Scurf pea	12	—	—	—	—	12
Agropyron cristatum Crested wheatgrass	—	—	1	—	—	1
Salsola pesitfer Russian thistle	—	—	—	2	4	6
Erodium cicutarium Storksbill	—	1	—	—	—	1
Poa bulbosa Bulbous bluegrass	—	—	—	—	3	3
Poa secunda Sandberg's bluegrass	—	—	—	—	12	12
Bare ground	4	8	4	—	11	27
Litter	18	23	11	3	22	77
Rock (gravel road)	—	—	—	72	—	72

6.2.3 SWMU 12 - Pesticide Disposal Area/SWMU 15 - Sanitary Landfill

SWMUs 12 and 15 - Vegetation—Five point-intercept transects were randomly placed at SWMUs 12/15 as shown in Figure 6-6. Species encountered along the transect and their relative dominance, frequency, and importance are shown in Table 6-7. A total of 19 species were encountered in the transects: 2 were shrubs/half-shrubs; 7 were grasses; and 10 were forbs. Of the 19 species, 10 are natives and 9 are introduced from Europe, Eurasia, or the Mediterranean area. The native species include two shrub, three forb, and five perennial grass species.

The dominants, in terms of relative dominance, were two introduced species, cheatgrass (16 percent) and white sweetclover (17 percent). The next most dominant species (7 percent relative dominance) was curlycup gumweed, a native forb that is found in disturbed areas, along roadsides, and in dry pastures. Prostrate knotweed (*Polygonum aviculare*), an introduced annual forb, and purple three-awn, a native bunchgrass, had a relative dominance of 3 percent each. The remaining 14 species contributed 2 percent or less individually to relative dominance.

The total vegetated area of SWMUs 12/15 was less than 60 percent. Of the vegetation, 72 percent was comprised of introduced annual species and 15 percent was perennial native species. Unlike the SWMUs discussed previously, annual forb species were a major component of the plant community at these SWMUs.

Based on results of point-intercept transects, SWMUs 12/15 represent a cheatgrass/annual forb community. The high cover values contributed by introduced annual species indicate past community disturbance. Visual evidence indicates the disturbance is caused mainly by surface earth-moving activities and vehicular traffic in and around the landfill areas.

SWMUs 12 and 15 - Small Mammals—One small-mammal live-trapping grid was randomly placed at SWMUs 12/15 and operated for 3 consecutive nights as shown in Figure 6-6. Three species of small mammals were trapped at this location. The most abundant small mammal was the deer mouse. There were 23 total captures of 4 males and 8 females over the 3-night period. Eleven adults and one subadult were captured.

Six Ord's kangaroo rats were captured: three males, two females, and one of unknown sex. Only adults were in the capture population. One male was reproductive. An adult Ord's kangaroo rat is approximately 2 to 2.5 times the weight of an adult deer mouse. The Ord's kangaroo rat occurs throughout Utah in lower elevation sandy and gravelly soils in a variety of vegetation types. At this trapping location, the soils were sandy on the northern and eastern edge of the grid, while the remainder was hard-packed gravelly soils of the landfill cap.

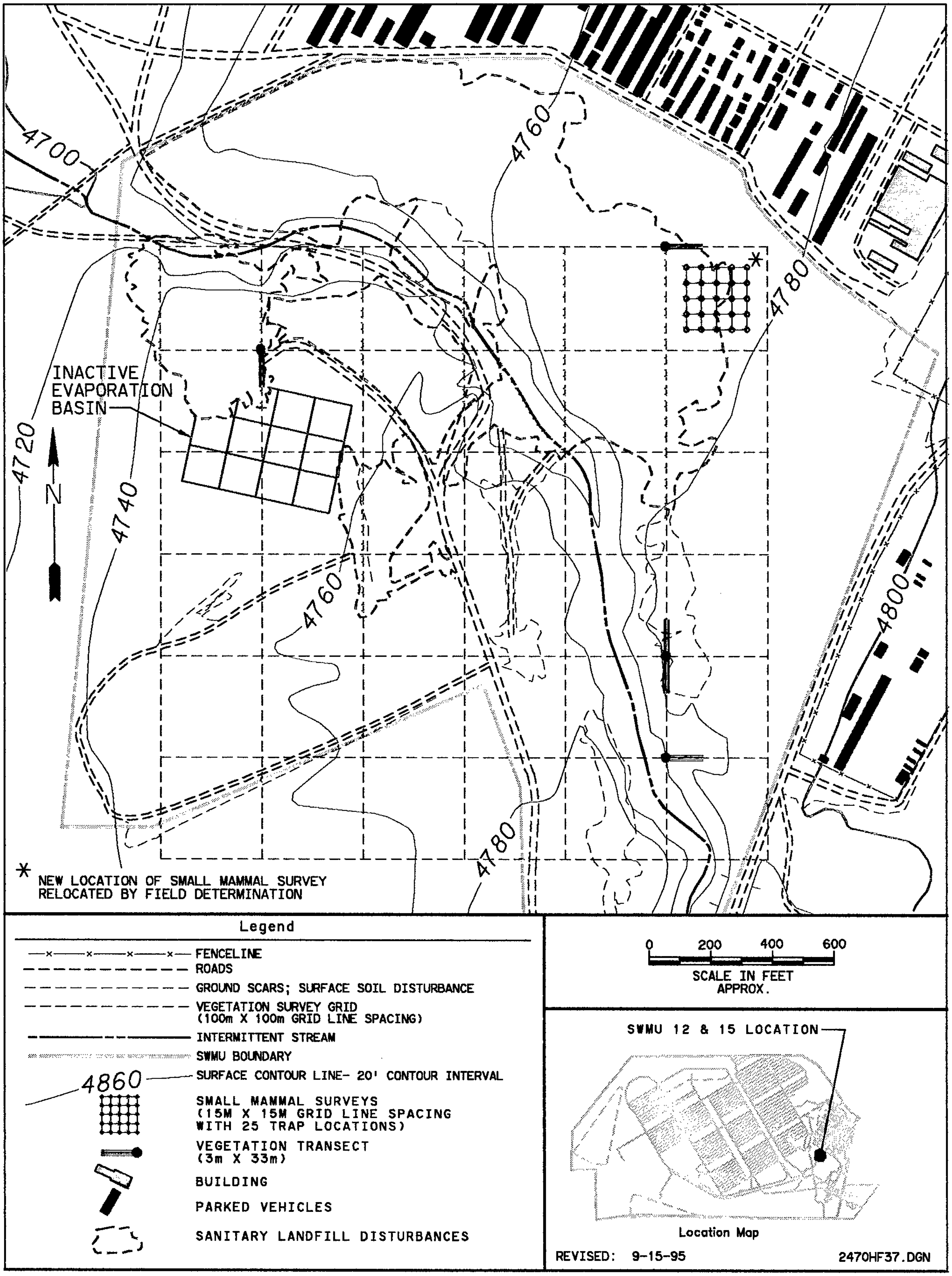

Figure 6-6. Quantitative Survey Locations for SWMUs 12/15 (Pesticide Disposal/Sanitary Landfill) - Vegetation/Small Mammal

Table 6-7. Results of Point Intercept Transects During Quantitative Vegetation Surveys at SWMUs 12/15 (September 17, 1994)

Species Common/Scientific	Transect #1 (6NW)	Transect #2 (24W)	Transect #3 (29NE)	Transect #4 (36NW)	Transect #5 (7NE)	Totals
Ambrosia acanthacarpa Annual bursage	1	—	—	—	5	6
Polygonum aviculare Bur buttercup	17	—	—	—	—	17
Helianthus annuus Common sunflower	6	1	—	—	1	8
Erodium cicutarium Storksbill	1	—	—	—	—	1
Melilotus alba White sweetclover	3	29	3	17	32	84
Ranunculus testiculatus Bur buttercup	6	—	—	—	—	6
Bromus tectorum Cheatgrass	—	19	40	17	3	79
Grindelia squarrosa Curlycup gumweed	—	14	7	8	5	34
Poa bulbosa Bulbous bluegrass	—	1	6	—	—	7
Lactuca scarriola Prickly lettuce	—	—	—	—	1	1
Poa secunda Sandberg's bluegrass	—	1	1	—	—	2
Sisymbrium altissimum Jim Hill mustard	—	—	—	—	1	1
Salsola pesitfer Russian thistle	1	3	—	—	6	10
Aristida purpurea Purple three-awn	—	4	3	10	—	17
Sporobolus cryptandrus Sand dropseed	—	1	—	—	—	1
Gutierrezia sarothrae Broom snakeweed	—	1	1	3	—	5
Sitanion hystrix Squirreltail	—	—	3	2	—	5
Stipa comata Needle and threadgrass	—	—	1	—	—	1
Chrysothamnus nauseosus Rubber rabbitbrush	—	—	1	—	3	4
Rock	21	9	14	23	33	100
Bare ground	40	—	—	12	—	52
Litter	—	23	18	9	12	62

The kangaroo rat is mainly a seed eater, and arthropods form only a small portion of its diet. This species is active throughout the year. Fluctuations in populations occur on a seasonal and yearly basis.

The kangaroo rat mean home range in the Uinta Basin was estimated at 1.2 acres, and at 1.5 acres in eastern California. The kangaroo rat home range at TEAD is probably similar.

Two Great Basin pocket mice were also captured at this trapping grid, one adult male and one adult female.

These SWMUs are dominated by the deer mouse. The next most abundant small mammal is the Ord's kangaroo rat.

6.2.4 SWMU 1b - Burn Pads/SWMU 1c - Trash Burn Pits

SWMUs 1b and 1c - Vegetation—Five point-intercept transects were randomly placed at SWMUs 1b and 1c as shown in Figure 6-7. Species encountered along the transect and their relative dominance, frequency, and importance are shown in Table 6-8. Fourteen total species were encountered in the transects. Of these, three were shrubs/half-shrubs, eight were grasses, and three were forbs. A total of 11 of the 14 species are natives, and 3 species are introduced from Europe and Eurasia. The native species include three shrub/half-shrubs, one forb, and six perennial grass species. Introduced species include two grasses and two forbs.

The dominant species, in terms of relative dominance, was cheatgrass (23 percent) followed by rubber rabbitbrush (6 percent), sand dropseed (6 percent), and needle and threadgrass (5 percent). Total relative dominance values for all species at this site was approximately 67 percent. Cheatgrass was the only introduced species of the four dominants. This site has been repeatedly disturbed by TEAD operations, and the high cover values for cheatgrass reflect its successful establishment at this site. Sand dropseed and needle and threadgrass are also becoming re-established at this site.

Based on the results of point-intercept transects, SWMUs 1b/1c is a cheatgrass/native bunchgrass community. The three shrub/half-shrub species contribute approximately 8 percent of total cover to this community; however, because of bulk and appearance, they are the more visually conspicuous members of this community.

SWMUs 1b and 1c - Small Mammals—One small-mammal live-trapping grid was randomly placed at SWMUs 1b/1c and operated for 3 consecutive nights as shown in Figure 6-7. Two species of small mammals were trapped at this SWMU. The most abundant small mammal was the deer mouse. There were 21 total captures of 5 males and 4 females over the 3-night period. These nine were adults. One individual was in reproduction condition, indicating recruitment into the population.

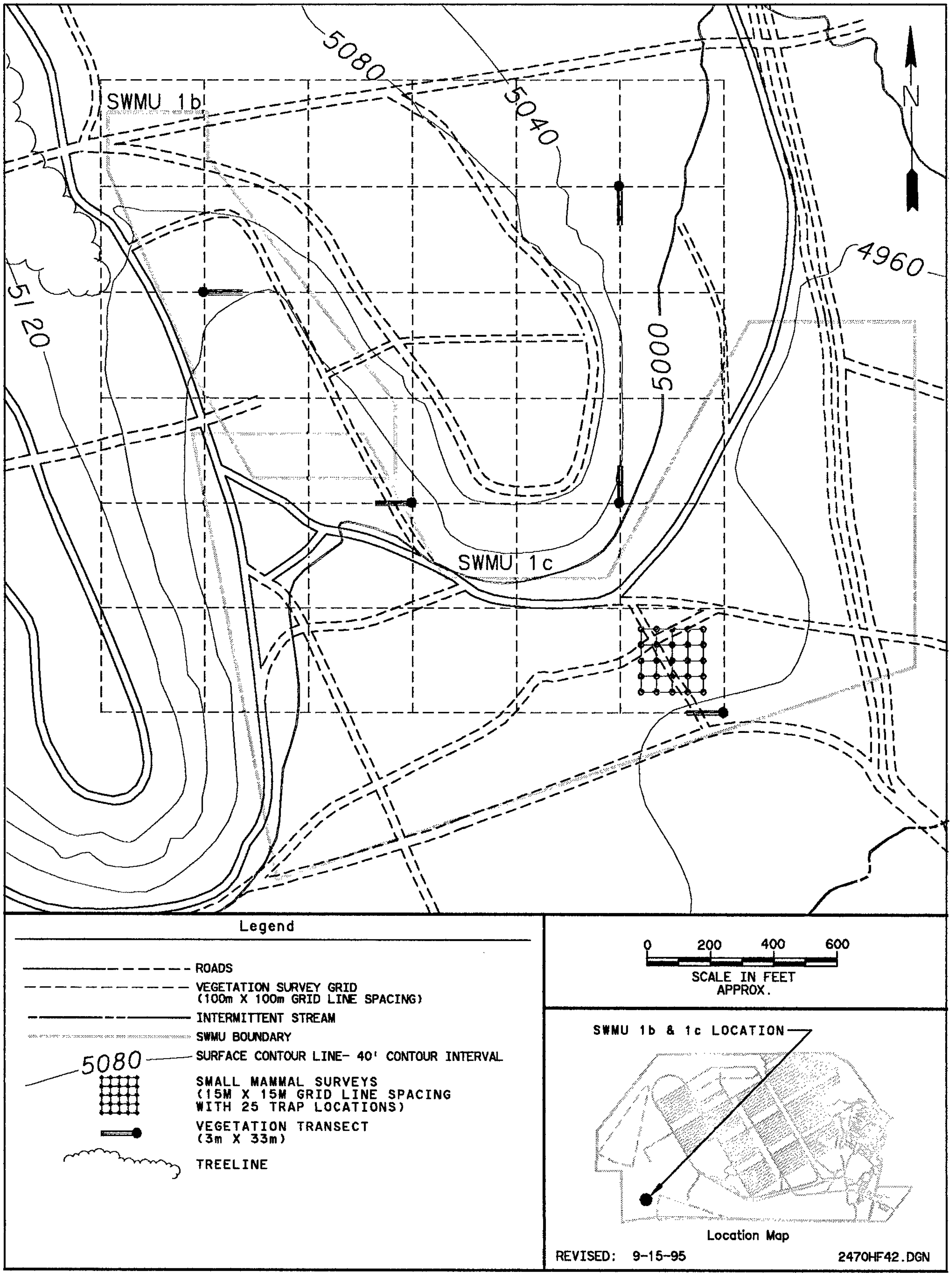

Figure 6-7. Quantitative Survey Locations for SWMUs 1b/1c (Open Burn/Open Detonation Burn Pads/Trash Burn Pits) - Vegetation/Small Mammal

Table 6-8. Results of Point-Intercept Transects During Quantitative Vegetation Surveys at SWMUs 1b/1c (September 16, 1994)

Species Common/Scientific	Transect #1 (36SE)	Transect #2 (24SW)	Transect #3 (11NE)	Transect #4 (21SE)	Transect #5 (14NE)	Totals
Bromus tectorum Cheatgrass	30	40	1	34	12	117
Gutierrezia sarothrae Broom snakeweed	11	—	—	—	—	11
Aristida purpurea Purple three-awn	1	5	—	—	3	9
Poa secunda Sandberg's bluegrass	12	2	1	10	—	25
Helianthus annuus Common sunflower	—	1	—	—	—	1
Ranunculus testiculatus Bur buttercup	2	—	—	—	—	2
Poa fendleriana Muttongrass	—	9	9	—	—	18
Hilaria jamesii Galleta grass	—	1	—	8	—	9
Stipa comata Needle and threadgrass	—	2	24	1		27
Sporobolus cryptandrus Sand dropseed	—	7	5	5	5	22
Stipa trachycaulum Slender wheatgrass	—	9	—	—	—	9
Chrysothamnus viscidiflorus Green rabbitbrush	—	—	3	—	—	3
Grindelia squarrosa Curlycup gumweed	—	—	—	7	—	7
Chrysothamnus nauseosus Rubber rabbitbrush	—	—	—	—	28	28
Bare ground	15	2	24	21	36	98
Litter	29	13	30	14	16	102
Rock	—	15	—	—	—	15

There were 12 total captures of 4 male, 5 female, and 1 unknown sex Ord's kangaroo rats. Only adults were captured. Three of those individuals were in reproductive condition.

Although this plant community has been altered through burning and grading activities, an abundant population of deer mice and kangaroo rats exists here. It is possible that the high percentage of annual species that produce succulent tissues and abundant seed provides these small mammals with an ample food supply. Kangaroo rats prefer open habitat such as that created through facility activities as opposed to a closed canopy of vegetation, and this also may account for their abundance.

The deer mouse is the dominant small mammal at this location.

6.2.5 SWMU 21 - AED Deactivation Furnace/SWMU 37 - Contaminated Waste Processor

SWMUs 21 and 37 - Vegetation—Five point-intercept transects were randomly placed at SWMUs 21/37 as shown in Figure 6-8. Species encountered along the transect and their relative dominance, frequency, and importance are shown in Table 6-9. Fourteen species were encountered in the transects, including four shrubs/half-shrubs, nine grasses, and one forb. Of the 14 species, 11 are natives and 3 were introduced from Europe and Eurasia. The native species include four shrubs, one forb, and six perennial grass species.

Cheatgrass was the dominant species (relative dominance - 12 percent) followed by Sandberg's bluegrass (11 percent), big sagebrush (6 percent), needle and threadgrass (5 percent), and crested wheatgrass (4 percent). Cheatgrass and crested wheatgrass are introduced species. It has been mentioned above that cheatgrass is a pioneering species, while crested wheatgrass is used to seed disturbed areas. Big sagebrush, needle and threadgrass, and Sandberg's bluegrass are all native species.

Matchweed and green rabbitbrush each had a relative dominance of 3 percent. The dominant character of this location's vegetation is shaped by big sagebrush. Grasses, although dominant in terms of relative dominance, are not as conspicuous as big sagebrush.

Based on results of point-intercept transects, SWMUs 21/37 represent a big sagebrush/native bunchgrass community. The dominant and conspicuous shrub species is big sagebrush. Sandberg's bluegrass and cheatgrass are the dominant grass species. The high cover values contributed by native bunchgrasses indicate that this community, although moderately disturbed, still has a large component of native species.

SWMUs 21 and 37 - Small Mammals—One small-mammal live-trapping grid was randomly placed at SWMUs 21/37 and operated for 3 consecutive nights as shown in Figure 6-8. Three species of small mammals were trapped at this location. The most abundant small mammal was the deer mouse. There were 33 total captures of 10 males, 9 females, and 1 of unknown sex during the 3-night period. These 19 were adults. Three individuals were in reproductive condition.

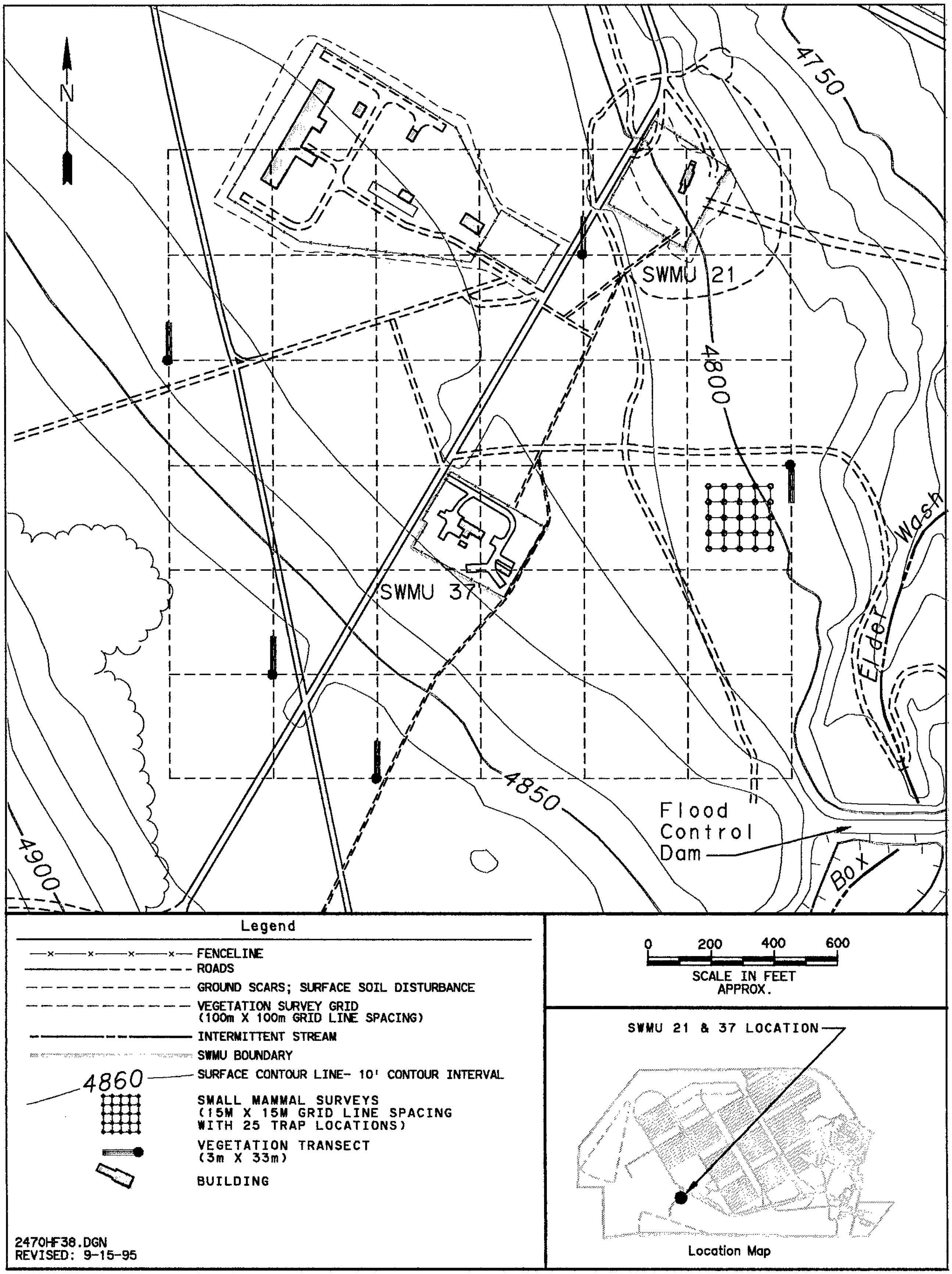

Figure 6-8. Quantitative Survey Locations for SWMUs 21/37 (AED Deactivation Furnace/ Contaminated Waste Proccessor) - Vegetation/Small Mammal

Table 6-9. Results of Point Intercept Transects During Quantitative Vegetation Surveys at SWMUs 21/37 (September 16, 1994)

Species Common/Scientific	Transect #1 (33SW)	Transect #2 (26SW)	Transect #3 (24NE)	Transect #4 (5SW)	Transect #5 (7SW)	Totals
Artemisia tridentata Big sagebrush	6	—	9	7	7	29
Gutierrezia sarothrae Broom snakeweed	5	4	5	1	1	16
Agropyron cristatum Crested wheatgrass	22	—	—	—	—	22
Bromus tectorum Cheatgrass	1	22	14	18	7	62
Chrysothamnus nauseosus Rubber rabbitbrush	1	—	—	—	—	1
Stipa comata Needle and threadgrass	—	26	—	—	5	31
Stipa hymenoides Indian ricegass	—	—	—	—	3	3
Sporobolus cryptandrus Sand dropseed	—	2	1	—	—	3
Aristida purpurea Purple three-awn	—	1	—	—	—	1
Poa secunda Sandberg's bluegrass	—	1	14	21	20	56
Poa bulbosa Bulbous bluegrass	—	—	—	—	1	1
Grindelia squarrosa Curlycup gumweed	1	—	—	—	—	1
Chrysothamnus viscidiflorus Green rabbitbrush	—	—	4	4	8	16
Agropyron smithii Western wheatgrass	—	—	—	1	2	3
Bare ground	41	12	26	23	26	128
Litter	23	29	28	28	19	127

There were 12 total captures of 6 male, 3 female, and 1 of unknown sex Ord's kangaroo rat. Only adults were captured. One Western harvest mouse was captured during this trapping period.

6.2.6 Reference Study Area

RSA Vegetation—Five point-intercept transects were randomly placed at the RSA as shown in Figure 6-9. Species encountered along the transect and their relative dominance, frequency, and importance are shown in Table 6-10. Eleven total species were encountered in the transects. Of these, four were shrubs/half-shrubs, five were grasses, one was a cactus, and one a forb. Of the 11 species, 9 are natives and 2 were introduced from Europe and Eurasia. The native species include four shrubs, one cactus, and four perennial grass species.

The dominant species were cheatgrass (26 percent relative dominance) and Sandberg's bluegrass (11 percent). These were followed by big sagebrush at 7 percent, matchweed at 5 percent, and black greasewood at 4 percent, all of which are shrubs. The remaining six species each contributed 1 percent or less to relative dominance. Even at the RSA, cheatgrass, an introduced annual species, was dominant. The presence of cheatgrass indicates the extent to which vegetation disturbances have previously occurred in the Tooele and Rush Valleys.

The RSA is a relic big sagebrush community type. As with the TEAD SWMUs, there are probably other vegetation species present in this community, particularly forbs, which were not evident because of the season of the year. Black greasewood and shadscale are both present on TEAD but were not encountered in any of the quantitative vegetation transects as they were at the RSA. The dominant character of this vegetation is shaped by big sagebrush. Grasses, although dominant in terms of relative dominance, were not as conspicuous as the big sagebrush.

Based on the results of the point-intercept transects, the RSA is a big sagebrush/native bunchgrass community. The dominant and conspicuous shrub species is big sagebrush. Sandberg's bluegrass and cheatgrass are the dominant grass species.

RSA - Small Mammals—One small-mammal live-trapping grid was randomly placed at the RSA and operated for 3 consecutive nights as shown in Figure 6-9. Six species of small mammals were trapped over 3 nights. The most abundant small mammal was the deer mouse. There were 34 total captures of 14 males and 8 females over the 3-night period. Of these, 18 were adults and 4 were subadults. Two individuals were in reproductive condition.

There were 10 total captures of 5 male and 2 female least chipmunks. Only adults were captured, and one individual was in reproductive condition. There were nine total captures of two male and six female mountain voles (two different species identified). Only adults were captured, and none were in reproductive condition. Only one adult female sagebrush vole was captured. There were seven total captures of one male and four female Great Basin pocket mice. Three were adults and two were subadults. No juveniles were captured, and none were in reproductive condition.

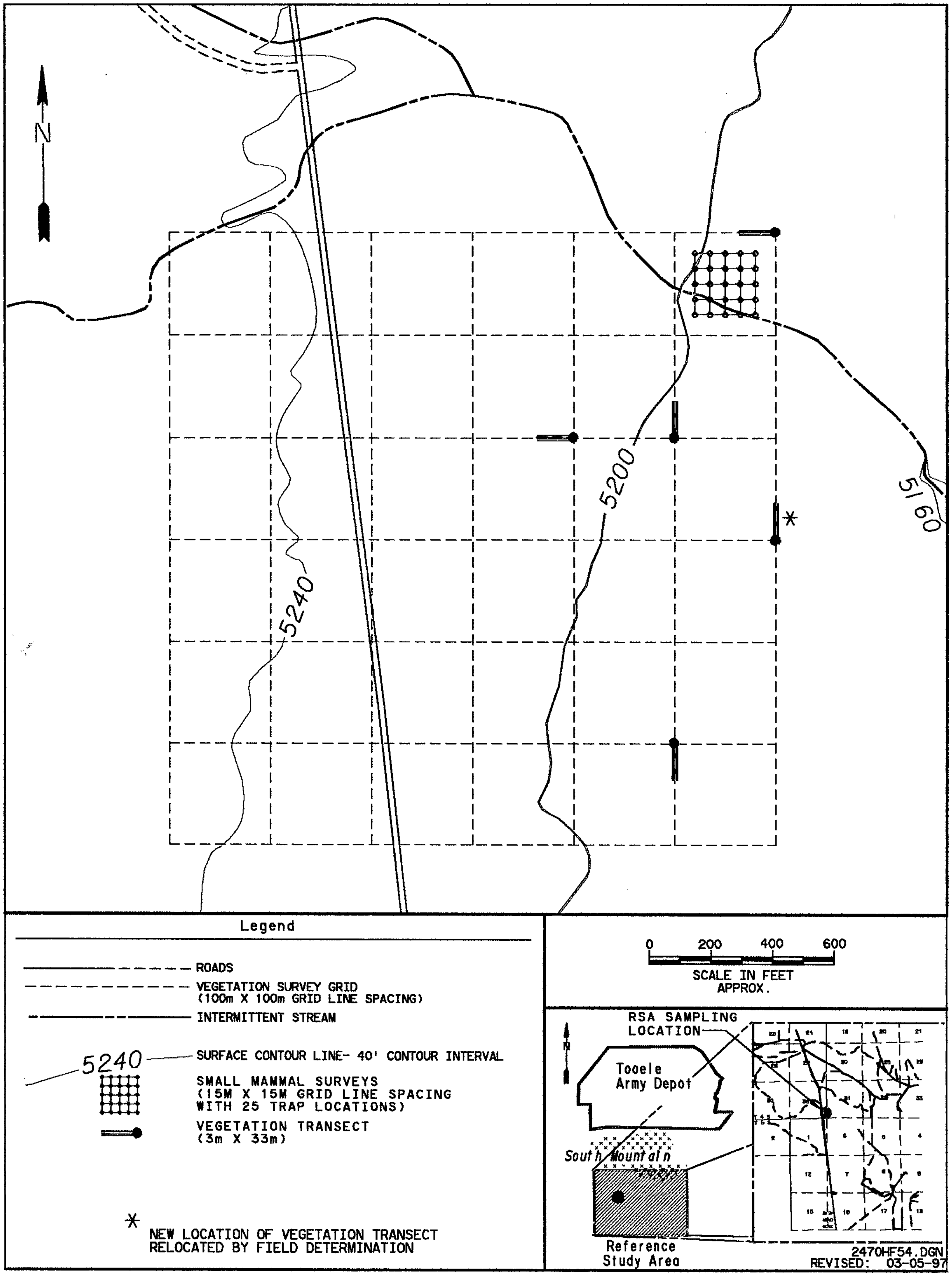

Figure 6-9. Quantitative Survey Locations for the Reference Study Area (RSA) - Vegetation/Small Mammal

Table 6-10. Results of Point-Intercept Transects During Quantitative Vegetation Surveys at the RSA (September 19, 1994)

Species Common/Scientific	Transect #1 (6 NE)	Transect #2 (11SE)	Transect #3 (16NE)	Transect #4 (18SE)	Transect #5 (36NW)	Totals
Bromus tectorum Cheatgrass	12	13	36	40	28	129
Artemisia tridentata Big sagebrush	1	6	11	9	8	35
Poa secunda Sandberg's bluegrass	23	14	1	—	18	56
Gutierrezia sarothrae Broom snakeweed	15	4	2	4	—	25
Sarcobatus vermiculatus Black greasewood	1	7	4	2	7	21
Atriplex confertifolia Shadscale	—	2	—	2	—	4
Opuntia polyacantha Plains prickly pear	—	1	—	—	—	1
Sitanion hystrix Squirreltail	—	1	—	—	—	1
Stipa hymenoides Indian ricegrass	—	1	—	—	—	1
Poa bulbosa Bulbous bluegrass	—	—	2	—	—	2
Napeta cataria Catnip	—	—	—	1	—	1
Bare ground	13	26	3	12	13	67
Litter	36	27	41	28	26	158

The relic sagebrush plant community at the RSA has been disturbed in the past by overgrazing. Recent lower livestock stocking rates have allowed this community to partially recover. Of all the small mammal trapping sites, this location supported the most diverse small mammal community. Three species captured here (least chipmunk, mountain vole, and sagebrush vole) were not captured at trapping sites on TEAD. The reasons for the difference in species diversity could be disturbance, trapping location, limited data, or true population differences. These data are analyzed in more detail in Section 7.2.3, Stress Response Analysis.

7.0 ECOLOGICAL RISK ASSESSMENT

7.1. INTRODUCTION

The Ecological Risk Assessment utilizes data collected and described in the preceding sections of this report to assess potential adverse effects on terrestrial and aquatic ecosystems at TEAD. The risk assessment contains a terrestrial risk analysis for all SWMUs and an aquatic risk analysis for SWMU 14 Sewage Lagoons only. The terrestrial risk assessment is structured with a problem formulation, exposure analysis (evaluation of exposure point concentrations and exposure intakes (i.e., doses)), stress response assessment (evaluation of biological population data), and risk characterization. The aquatic risk assessment also contains a problem formulation, exposure analysis, and risk characterization. The toxicity assessment (Section 7.3) for all ecological receptors provides information regarding the toxicity values used in both the aquatic and terrestrial risk assessments. The risk characterization compared exposure information to toxicity information, resulting in HQs and HIs for each of the exposure pathways quantitatively addressed. Uncertainties for both the terrestrial and aquatic risk characterizations are also addressed, including a weight of evidence (WOE) approach used in the interpretation of the risk assessment results. A SWMU-by-SWMU risk description and summary table of the SWERA results conclude the report.

7.2 TERRESTRIAL ECOSYSTEM RISK ASSESSMENT

7.2.1 Problem Formulation

The introductory sections of this report discuss the history (Section 1.4), physical characteristics (Section 1.5), and ecological characteristics (Section 1.6) of TEAD. These factors were considered when designing the sampling program (SWEAP/QAPjP, Rust E&I, 1994c) in order to collect data adequate for addressing ecological risk at TEAD.

TEAD has many different SWMUs that may pose an ecological risk. The SWMU data were compared to data from the RSA outside the boundaries of TEAD. The RSA data provided a baseline for comparison, in addition to the background data collected within the boundaries of TEAD. All analytes that passed the COPC screening process were evaluated as COPCs for the risk assessment. Soil and sediment data from all SWMUs were considered, except those SWMUs for which (1) a ROD already existed, (2) data became available after the SWERA was complete, or (3) the SWMU was identified as a BRAC parcel SWMU with very little or no ecological habitat. Surface water data were evaluated at all SWMUs where water occurred that was accessible to wildlife or birds. This process of evaluating all abiotic data collected at TEAD allowed for the assessment of risk on a site-by-site basis at all locations. At SWMUs where no samples were collected, the "no action alternative" was inferred. In addition, biometric data and tissue analytical data were collected at several representative SWMUs and were utilized to substantiate the results of the risk assessment.

The assessment and measurement endpoints for the terrestrial ecosystem at TEAD are presented in Table 2-1, Section 2.1.2. The assessment endpoints were selected after careful review of the site ecology, including consideration of major food chains, key species, and potentially occurring threatened and endangered species. The measurement endpoints were selected following discussion with the ETAG, and include chemical analysis and/or evaluation of abiotic media from various locations (i.e., soil, surface water, and sediment), as well as chemical analysis of species considered representative of TEAD and likely to be highly exposed (i.e., several plant species, terrestrial invertebrates, and jackrabbits). Biological parameters indicative of population success (i.e., occurrence, density, diversity, body weight, and age) were measured for small mammals. Indicators of vegetation population success (i.e., density) were measured for plants. The risk assessment compares the analytical and biological (biometric) data from the RSA, or presumed unimpacted area, to corresponding data from specific areas of TEAD.

7.2.2 Terrestrial Ecosystem Exposure Analysis

The exposure analysis quantifies daily chemical intakes (i.e., doses) of the COPCs. The analytes in surface soil and sediment were screened for a detection frequency greater than or equal to 5 percent. Those COPCs that did not occur with a detection frequency greater than or equal to 5 percent were excluded from further consideration. Due to the large number of COPCs, and the lack of specific toxicity information for many of the compounds, certain analytes were combined by category (Section 2.2.2.1). The analytes that passed the detection frequency screen were evaluated further; one-half the CRL or MDL was substituted for nondetects. Data from within buildings were not evaluated. Section 2.2.2 provided a detailed explanation of the COPC screening. This process of screening for COPCs focused the risk assessment on those analytes and SWMUs likely to present a potential risk.

The maximum detected value was then compared to the UCL95 for each analyte, and the lower of the two values was selected as the Cterm (concentration term). Analytes typically considered nutrients (i.e., calcium, potassium, sodium, and magnesium) were not evaluated. Other analytes typically considered nutrients but toxic at high concentrations, such as aluminum and iron, were retained and evaluated semi-quantitatively.

Daily chemical intakes (mg chemical(i.e., COPC) /kg bw/day), hereafter referred to simply as intakes, were calculated using the reasonable maximum exposure (RME) scenario, which included the lesser of the UCL95 or maximum Cterm concentrations for COPCs, and the 95th percentile exposure parameters including ingestion rates, body weights, and home ranges. The exposure parameters incorporated values for juveniles as well as adult receptors. This approach was meant to be conservative and followed USEPA comments (ETAG, May 1996). (**Note:** Currently, USEPA Region VIII indicates a preference for the term "dose" rather than "intake"; however, due to the extensive revisions which would be necessary to implement this change in the revised final SWERA, the term "intake" will be used synonymously with "dose" throughout this report.)

Dietary intakes were calculated at only the ESA SWMUs, the RSA, and the ESA SWMUs on an ESA basis. By adopting the ESA approach identified in the SWERA work plan, any risks associated with dietary ingestion were assumed to be representative of the entire facility. This was consistent with a baseline ERA.

7.2.2.1 *Media Ingestion Rates*

Daily media ingestion rates were obtained for the ecological receptors at TEAD. The ingestion rates are expressed in terms of kilograms media ingested per kilograms body weight per day (i.e., kg media/kg bw/day). Dietary ingestion is the kg diet/kg bw/day ingested by the animal.

Soil ingestion rates, expressed as kg soil/kg bw/day, are the product of the dietary ingestion rate and the fraction of soil in the diet:

Soil Ingestion Rate (kg soil/kg bw/day)	=	Dietary Ingestion Rate * Soil Fraction in Diet (kg diet/kg bw/day)	(Equation 7-1)

Water ingestion is the daily volume of water (L/kg bw/day) ingested. Not all animals consume surface water; for example, deer mice and other small rodents likely meet their daily water requirements through dietary ingestion or ingestion of dew. Mule deer and the kit fox are also presumed to gain much of their water intake through other than free water sources. Estimated dietary ingestion rates, soil ingestion rates, and surface water ingestion rates are presented in Table 7-1.

In instances where measured data were unavailable, allometric equations were used which scale the parameter of interest to the body mass of the key receptor species. This is done because of the observation that many physiological processes vary as a function of body weight. The body weight range (minima and maxima) were thus used to obtain a range in the parameter such as inhalation or water ingestion rate. Appendix I contains all of the data used to derive the exposure parameters presented in Table 7-1.

Deer Mouse—All data cited for deer mouse adults and juveniles in USEPA (1993a) were considered in order to develop summary statistics for body weight, dietary ingestion rate, and home range. When the data cited in USEPA (1993a) for dietary ingestion rates were provided in units of g/day, the mean estimated body weight was used to normalize the ingestion rates to g/g bw/day and kg/ kg bw/day. The fraction of soil in the diet was estimated from two values in Beyer et al. (1994), which were for surrogate species, the meadow vole, and the white-footed mouse. Water ingestion for the deer mouse was not evaluated since it is likely that they obtain their water requirement through diet. With the exception of the mean body weight used to normalize the ingestion rates, all other exposure parameters used the 95th percentile values.

Jackrabbit—All data cited for cottontail rabbits in USEPA (1993a) were considered in order to develop summary statistics for body weight and water ingestion rate for jackrabbits. The

Table 7-1. Exposure Parameters for TEAD Terrestrial Ecological Receptors

Receptor	Summary Statistics	Body Weight (g)	Dietary Ingestion Rate (kg/kg bw/d)	Water Ingestion Rate (L/kg bw/d)	Home Range (acres)	Soil Ingestion (Percent of Diet)	Soil Ingestion Rate (kg/kg bw/d)
Deer Mouse	Minimum	14	0.07	0.06	0.0	2.0	1.40E-03
	Maximum	32	0.45	0.34	2.3	2.4	1.08E-02
	Mean	21	0.19	0.15	0.3	2.2	4.22E-03
	SD	4	0.09	0.07	0.5	0.3	2.55E-04
	95th percentile	29	0.37	0.25	1.0	2.4	8.85E-03
Jackrabbit	Minimum	1132	0.001	0.10	NA	2.0	1.35E-05
	Maximum	3200	0.11	0.10	NA	2.0	2.18E-03
	Mean	1391	0.04	0.10	NA	2.0	8.87E-04
	SD	573	0.05	NA	NA	0.0	0.00E+00
	95th percentile	2162	0.10	0.10	**103**	2.0	2.06E-03
Kit Fox	Minimum	1400	0.07	0.03	179	2.8	1.93E-03
	Maximum	2100	0.16	0.03	4917	2.8	4.48E-03
	Mean	1775	0.11	0.03	2117	2.8	3.15E-03
	SD	377	0.04	0.003	1706	NA	NA
	95th percentile	2100	0.16	0.03	4883	2.8	4.34E-03
Mule Deer	Minimum	25600	0.02	0.01	NA	2.0	4.12E-04
	Maximum	200000	0.04	0.02	NA	2.0	7.22E-04
	Mean	80700	0.03	0.02	NA	2.0	5.67E-04
	SD	82149	0.01	0.02	NA	0.0	0.00E+00
	95th percentile	180500	0.04	0.02	**400**	2.0	7.07E-04
Passerine	Minimum	8	0.67	0.06	0.0	9.3	6.23E-02
	Maximum	189	1.52	0.14	1.0	10.4	1.58E-01
	Mean	35	0.96	0.09	0.3	9.9	9.49E-02
	SD	40	0.30	0.02	0.3	0.8	2.33E-03
	95th percentile	84	1.39	0.13	0.6	10.3	1.44E-01
American Kestrel	Minimum	103	0.29	0.11	32	2.8	8.12E-03
	Maximum	138	0.29	0.12	499	2.8	8.12E-03
	Mean	119	0.29	0.12	263	2.8	8.12E-03
	SD	11	NA	0.01	200	NA	NA
	95th percentile	135	0.29	0.12	475	2.8	8.12E-03
Golden Eagle	Minimum	4014	0.07	0.01	4522	2.8	1.82E-03
	Maximum	5244	0.14	0.01	8634	2.8	3.92E-03
	Mean	4630	0.10	0.01	5934	2.8	2.81E-03
	SD	485	0.03	0.002	2339	NA	NA
	95th percentile	5219	0.13	0.01	8235	2.8	3.72E-03
Bald Eagle	Minimum	4014	0.07	0.01	4522	2.8	1.82E-03
	Maximum	5244	0.14	0.01	8634	2.8	3.92E-03
	Mean	4630	0.10	0.01	5934	2.8	2.81E-03
	SD	485	0.03	0.002	2339	NA	NA
	95th percentile	5219	0.13	0.01	8235	2.8	3.72E-03
Great horned owl (same as bald eagle)	Minimum	4014	0.07	0.01	4522	2.8	1.82E-03
	Maximum	5244	0.14	0.01	8634	2.8	3.92E-03
	Mean	4630	0.10	0.01	5934	2.8	2.81E-03
	SD	485	0.03	0.002	2339	NA	NA
	95th percentile	5219	0.13	0.01	8235	2.8	3.72E-03

Notes.– Values in bold represent only value available, not 95th percentile.

Exposure parameters in this table were calculated from data located in Appendix I, pp 883-888.

Minimum and maximum DIR and WIR values in this table represent the minimum and maximum values calculated on a *range* of values; where measured data were unavailable, these values were derived from allometric calculations utilizing minimum and maximum body weight as appropriate in Appendix I, pp. 883-888. Thus, a maximum BW produces a minimum DIR or WIR and visa versa (i.e., WIR and DIR are inversely related to BW).

NA=Not applicable.

Sources:

Body Weight	USEPA 1993a
Dietary Ingestion Rate	USEPA 1993a
Water Ingestion Rate	USEPA 1993a
Home Range	USEPA 1993a
Soil Ingestion Rate	Beyer et al. 1994
Habitat -mammals	Burt and Grossenheider 1980
Habitat - birds	Udvardy 1977
Feeding Habits-mammals	Burt and Grossenheider 1980
Feeding Habits-birds	Udvardy 1977

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minimum and maximum body weights were used in the following allometric equation for dietary ingestion rate (USEPA 1993a):

(Equation 7-2)

$$DIR = \frac{0.577 * BW^{0.727}}{BW}$$

where

DIR = dietary ingestion rate (kg/kg bw/day)
BW = body weight (g)

The fraction of soil in the diet was estimated from data in Beyer et al. (1994), which included data for surrogate large herbivore species. Data for mule and white-tailed deer, moose, and elk were utilized to estimate a range for soil fraction in diet for jackrabbit. In the absence of species-specific data, a reasonably conservative assumption of 2 percent soil ingestion was used for jackrabbits.

Mule Deer—All data cited for deer in Burt and Grossenheider (1980) and Fitzgerald et al. (1994) were considered in order to develop summary statistics for body weight. The minimum and maximum body weights were used in Equation 7-2 for dietary ingestion. The water ingestion rate was estimated from measured data (Chew 1965) and the following allometric equation (USEPA 1993a):

(Equation 7-3)

$$WIR = \frac{0.099 * BW^{0.9}}{BW}$$

where

WIR = water ingestion rate (L/kg bw/day)
BW = body weight (kg)

All calculated values of WIR were divided by three to reflect lower usage of free water by mule deer in the wild (Chew 1965; Fitzgerald et al. 1994).

The fraction of soil in the diet was estimated from data in Beyer et al. (1994), which included data for mule deer as well as for several surrogate large herbivore species. Data for mule and white-tailed deer, moose, and elk were utilized to estimate a range for soil fraction in diet.

Kit Fox—Most of the data used to estimate exposure parameters for this species were obtained for a surrogate species, the red fox (USEPA 1993a; Beyer et al. 1994). All data for home range for farmland, mixed habitat, marsh, forest, prairie, shrubs, and savannah were used to develop estimates of home range (USEPA 1993a); studies for which the habitat type was not given were not used. The water ingestion rate was estimated from Equation 7-3 with the minimum and maximum body weights for kit fox (O'Neal et al; Egoscue 1956; Fitzgerald et al. 1994). The resulting WIR was divided by 3 to reflect the lack of free water usage by wild populations of the kit fox (O'Neal et al; Egoscue 1956; Fitzgerald et al. 1994).

Passerine Birds—Much of the data used to estimate exposure parameters for this group were obtained from USEPA (1993a) and Beyer et al. (1994). Data for territory size were often used in lieu of home range information; territory is the space that is defended and, as such, is smaller and thus more conservative than home range (USEPA 1993a). Data for marsh wren and robin were used to develop estimates of body weight, home range, and dietary ingestion rates for passerine birds. Body weights for other passerines were incorporated as well. The water ingestion rate was estimated from measured data for robin and bobwhite (USEPA 1993) and chickens (North 1984). The fraction of soil in diet was estimated from data for woodcock and turkey, which were the two most similar surrogate species for which data were available from Beyer et al. (1994).

Raptors—All data used to estimate exposure parameters for this group were obtained from USEPA (1993a), Johnsgard (1990) and Beyer et al. (1994). Data for territory size were often used in lieu of home range information; territory is the space that is defended and, as such, is smaller and thus more conservative than home range (USEPA 1993a). Data for bald eagle were used to represent exposure parameters for bald and golden eagles and the great horned owl, and American kestrel data were used to develop estimates of body weight, home range, and dietary ingestion rates for kestrels. The water ingestion rate was estimated from the minimum and maximum body weights, using Equation 7-4:

(Equation 7-4)

$$WIR = \frac{0.059 * BW^{0.67}}{BW}$$

where

WIR = water ingestion rate (L/kg bw/day)
BW = body weight (kg)

The water ingestion rate for both the bald and golden eagles was divided by 3 to reflect lower usage of free on-site water. The only predator for which data for fraction of soil in diet were available was the red fox. The fraction of soil in diet of raptors was, therefore, estimated from data for red fox (Beyer et al. 1994). Raptors are in the same feeding guild as the fox and feed on many similar prey items, such as mammals and invertebrates. Hunting or foraging techniques differ, but raptors would be expected to have a lower rate of soil ingestion since the fox may burrow and dig for prey, as well as consume fruits or seeds.

7.2.2.2 *Home Range Data and Area Use Factors*

Home range is the area that an animal is expected to occupy for feeding, breeding, and any other aspects of life history. The migratory species have more than one area in which they live. For example, a kestrel may require 475 acres for breeding in summer and then migrate to another location in the fall. No additional adjustment was applied to reduce the exposure to reflect migration in order to conservatively reflect exposure by nonmigratory species.

The home range values for the ecological receptors at TEAD, as listed in Table 7-1, were obtained, in part, from the USEPA's *Wildlife Exposure Handbook* (USEPA 1993a). The home range was used to calculate an area use factor (AUF). The area of each SWMU was divided by the home range for each receptor to obtain the AUF. When the SWMU is smaller than the home range, the AUF is less than 1. This reflects the fact that the animal feeds and moves over an area larger than the SWMU (i.e., integrates exposure over entire home range) and, therefore, exposure at the SWMU is reduced. When the SWMU area exceeded the home range, a value of 1 was used in the intake equations (i.e., exposure does not increase above 100 percent).

As a result of regulatory comments, the current co-located soil and biota data were evaluated on an ESA basis as well as on a SWMU basis, which was the approach presented in the SWERA work plan. The ESA approach was agreed upon by the USEPA and UDEQ and was the logic for collecting data on an ESA basis because receptors could be exposed to more than one SWMU. For many receptors, the AUF increased to 1 when the risk was evaluated on an ESA basis.

Summary statistics for the co-located soils and biota are presented in Appendix I. The areas of each SWMU and the AUFs for each receptor are presented in a table in Appendix B.

7.2.2.3 *Exposure Point Concentrations for the RSA and TEAD SWMUs*

The Cterm (also known as the exposure point concentration (EPC)) for soil, surface water, and biota is the UCL95 on the arithmetic mean or the maximum detected value, whichever is lower. In order to estimate Cterms, summary statistics (detection frequency, minimum, maximum, mean, standard deviation, and UCL95) were calculated for each individual analyte at each SWMU and at the RSA. In order to calculate the Cterms, the populations were assumed to be normal; however, this may violate the parametric statistical analysis upon which the UCL95 is based. A value of 1/2 the CRL or MDL was used as the data point for each nondetect for both the soil and biota data, respectively.

Because of the large size of the data sets, the tables that address the ecological risk assessment are summarized in Appendices B and I. The summary statistics for the current (co-located) soil and biota sample data (Fall 1994/1995 data) at the TEAD SWMUs and the RSA are summarized in Appendix I. The summary statistics based on the entire TEAD database (which includes *both* historic and current (co-located) soil and sediment data) are in Appendix B. The

1994 data were evaluated separately from the historic data because the Fall 1994/1995 sampling events resulted in data that were discrete from the data collected by several TEAD contractors over an extended period of time. This situation provided an opportunity to obtain two independent sets of risk assessment conclusions. The likelihood of sampling and analytical errors or bias would theoretically be reduced during the Fall 1994/1995 field activities, thereby providing a greater degree of confidence in the analytical results and risk assessment conclusions.

Summary statistics for the TEAD inorganic background data are presented in Table 2-5, while the RSA inorganic data are located in Table 5-42. The complete RSA summary statistics, including both inorganic and organic analytes, are located in Appendix I.

Air exposure point concentrations were available from several sources. The concentrations are from models based on human exposure factors, such as height, and do not necessarily reflect air concentrations that could be present in a burrow.

Appendix P of the *Revised Final RFI for Known Releases SWMUs* (Rust E&I 1995a) provided maximum hourly concentrations ($\mu g/m^3$) at 2 feet above the soil surface based on air modeling for SWMUs 12/15 and 10/11. The *Final Preliminary Baseline Risk Assessment* (Rust E&I 1993b) also reported modeled air concentrations for industrial sites SWMUs 29/30, and hypothetical future residential sites SWMUs 1, 10/11, and 29. These data are shown in Table 7-14 (Section 7.2.2.5.6). Only the highest concentrations reported at each location were used in the ecological risk assessment (i.e., concentrations for industrial sites SWMUs 29/30 exceeded those modeled for residential sites at SWMU 29, so only the modeled industrial concentrations were used). Concentrations were also reported for areas removed from the source, but these were considered less conservative than those for areas directly at the source.

7.2.2.4 *Terrestrial Ecosystem Food Web Model*

There are over 50 SWMUs within TEAD that are potentially contaminated with one or more chemicals. Chemical analysis of soils was performed historically at most of the TEAD SWMUs; however, samples for chemical analysis of vegetation were collected from only the 10 ESA SWMUs and the RSA. Invertebrate samples were collected at the same 10 ESA SWMUs and the RSA; these sampling sites overlapped those where plant samples were collected. Jackrabbits were collected at SWMUs 42/45 and the RSA. Because of the large number of potentially affected sites, a model was developed to predict COPC concentrations in plants, invertebrates, and jackrabbits and to calculate dietary intakes at locations where biota tissue concentrations were not available. This model was calibrated using data from the RSA. Data from the on-site study areas were used to validate the model. Four plant species (sweetclover, ambrosia, gumweed, and rabbitbrush), two invertebrate types (grasshoppers and beetles), and jackrabbit provided tissue data from which to calibrate and validate the model.

The model explores the possibility of predicting concentrations of various chemicals in lower trophic level species with sufficient accuracy so that risk assessment predictions can be made

from the results. The model could then be used, if necessary, at TEAD historic SWMUs for which tissue data are not available; however, this was deemed not necessary following discussions with the ETAG (ETAG 1997).

7.2.2.4.1 ***Model Development*****.** Plants were assumed to obtain all of their chemical content from soil; airborne fallout onto leaves was not estimated. Terrestrial invertebrates were also assumed to obtain all chemical exposure from soil. These assumptions lead to a generalization for plants and terrestrial invertebrates that the tissue concentration over time (expressed as a derivative) is related to an uptake rate (k1) times the concentration in soil, minus a loss rate (k2) times the concentration in the organism, for example:

$$\frac{dCplant}{dt}=k1*Csoil-k2*Cplant \qquad \text{(Equation 7-5)}$$

$$\frac{dCbug}{dt}=k1bug*Csoil-k2bug*Cbug \qquad \text{(Equation 7-6)}$$

where

Cplant	=	plant tissue concentration (mg/kg); will vary with time
Cbug	=	soil invertebrate tissue concentration (mg/kg); will vary with time
k1	=	plant uptake rate (day^{-1})
k2	=	plant loss rate (day^{-1})
k1bug	=	soil invertebrate uptake rate (day^{-1})
k2bug	=	soil invertebrate loss rate (day^{-1})
Csoil	=	average soil concentration at each ESA SWMU (mg/kg)

While the assumption that all or most tissue residues can be related to soil analyte concentrations is reasonable for plants, it represents a simplification for invertebrates in that some of their tissue residues relate to indirect exposure, such as dietary ingestion of plants, detritus, or other invertebrates. However, when modeling complex processes, it is preferable to start with a simple model and determine if the model performs adequately, rather than starting with a complex model. A more elaborate model would separate invertebrates into multiple feeding categories consisting of herbivores, omnivores, and carnivores. However, because the data are limited, and at some sites both grasshoppers and beetles were not available, this level of detail was not explored.

Jackrabbits were assumed to obtain a portion of their chemical body burden from soil, and a portion from dietary ingestion of plants, as follows:

(Equation 7-7)

$$\frac{dCjr}{dt} = (DIR * Cplant * AFjr * AUFjr) + (SIR * Csoil * AFjr * AUFjr) - (Cjr * Kel)$$

where

Cjr	=	tissue concentration in jackrabbit (mg/kg)
DIR	=	jackrabbit dietary ingestion rate (kg diet/kg bw/day)
Cplant	=	plant tissue concentration as a function of time (mg/kg)
AFjr	=	assimilation fraction for jackrabbit (unitless)
AUFjr	=	area use factor for jackrabbit (unitless)
SIR	=	soil ingestion rate (kg soil/kg bw/day)
Kel	=	loss rate for jackrabbit (1/day)
Csoil	=	average soil concentration at each ESA SWMU (mg/kg)

The dietary ingestion rate for jackrabbits (DIR) was estimated from the following allometric equation (USEPA 1993a):

$$DIR\ (kg/kg\ bw/day) = \frac{0.577 * Wt^{0.727}}{Wt} \qquad \text{(Equation 7-8)}$$

where

Wt = body weight (g)

Body weight for the black-tailed jackrabbit ranged from 1,300 to 3,100 g (USEPA 1993a). The body weights for the jackrabbits collected from TEAD fell within this range (Appendix C). The minimum and maximum body weights were used to derive dietary ingestion rates with Equation 7-8 (Table 7-1). The 95th percentile of the ingestion rates was used in the model. Soil ingestion as a fraction of diet for mule deer, elk, moose, and bison, all non-burrowing herbivores, was available from Beyer et al. (1994). Soil ingestion was low for these species and ranged up to 2 percent. The soil ingestion rate and the dietary ingestion rates for jackrabbits were held constant for all of the model runs.

The model incorporated equations for dietary intake by raptors in addition to the equations for chemical uptake by plants, invertebrates, and jackrabbits. The raptor intakes cannot be verified by the data collected because raptor food habits were assumed and not measured. The dietary ingestion rate used in the model for raptors was based on the American kestrel (*Falco sparverius*) and was 0.29 kg/kg bw/d (USEPA 1993a). The dietary ingestion rate for raptors was fixed for all of the model runs. This is then protective of larger species, such as golden

eagles, which have a lower dietary ingestion rate. Intakes by raptors feeding either on terrestrial invertebrates (e.g., the American kestrel) or on jackrabbits (e.g., the golden eagle) were predicted from the modeled tissue concentrations in lower trophic levels. These equations do not incorporate the soil ingestion fraction for raptors, only the food web transfer of contaminants. The equations for dietary intake (or dose) of chemicals for kestrels and large raptors were:

$$Intake\ (Kestrel)_{(mg/kg\ bw/day)} = (INTK*Cbug*AUFr) \quad \text{(Equation 7-9)}$$

$$Intake\ (Raptor)_{(mg/kg\ bw/day)} = (INTK*Cjr*AUFr) \quad \text{(Equation 7-10)}$$

where

INTK	=	dietary ingestion rate for raptors (kg diet/kg bw/day)
AUFr	=	area use factor for raptors
Cbug	=	soil invertebrate tissue concentration as a function of time (mg/kg)
Cjr	=	tissue concentration in jackrabbit (mg/kg)

The model was coded into Time0 (Quaternary Software, Fort Collins, Colorado), which simplifies model development by reducing the amount of computer code necessary. This software requires entry of the differential equations as presented above.

The arithmetic mean soil concentration of each chemical at the RSA was used as the basis for calibrating the model. The average RSA soil concentration was entered into the parameter file as Csoil. The mean was considered the appropriate basis for calibrating the model since the intent was to determine if the model could approximate the central tendency of the observed data at each SWMU.

The k1 and k2 values for plants were adjusted until the plant concentrations approximated average values observed at the RSA with a model run of 300 days. Since analytical data were available for up to four plant species at each study location, the model was adjusted to predict plant concentrations within the range of average concentrations for all plant species studied.

The uptake and loss rates for invertebrates and jackrabbits were adjusted until the tissue concentrations approximated average values at the RSA. Since analytical data were available for up to two invertebrate species at each study location where invertebrates were collected, the model was adjusted to predict invertebrate concentrations within the range of average concentrations for both invertebrate species studied.

In order to conservatively predict daily intake by raptors, the AUF for both jackrabbits and raptors was set to 1. Therefore, all model results for tissue concentrations are conservatively estimated such that the study location is providing 100 percent of the foraging habitat. After the model was calibrated with the RSA soil and biota data for a given analyte, the average soil concentration for each of the TEAD study areas was substituted for the concentration from the

RSA, and the output was examined to determine how closely plant, invertebrate, and jackrabbit concentrations were predicted.

Model fit was evaluated by dividing the model result by the arithmetic mean of the observed data for each of the sampled media (plants, invertebrates, and jackrabbits) as follows:

$$Factor=\frac{model\ result}{Mean\ observed\ result} \qquad \text{(Equation 7-11)}$$

The result of Equation 7-11 is interpreted as the model differs from the observed data by a factor of x. When the model result was less than the observed, the inverse of the above equation was used, and a minus sign was used in order to clarify how the model behaved relative to observed data. Thus, a positive result indicates that the model behaved in a conservative manner, overpredicting the observed data by some factor. A negative result indicates that the model underestimated the observed data.

The average measured concentrations for jackrabbits, plants, and invertebrates were used to compare to the model results. There was more than one species analyzed for plants and invertebrates. Prior to determining model fit as described by Equation 7-11, an "interspecific average" was calculated, which was the mean of the mean concentrations for each species at a given location. The interspecific mean was used as the denominator. For example, at the RSA, the average cadmium concentration in beetle and the average concentration in grasshoppers were averaged to obtain a single interspecific mean cadmium concentration for invertebrates.

Model fit can also be deduced graphically by comparing the observed data, PLNT (plant), JR (jackrabbit), or BUG (beetles and grasshoppers) to their respective modeled counterparts. The observed data were plotted at approximately 300 days for comparison to the model. The assumption behind this was that the field samples were at equilibrium with the soils and had been on site for the duration of the growing season. Jackrabbit samples were not collected at all locations; therefore, observed jackrabbit data are missing from all but SWMUs 42/45. When the model lines on the output figures (Appendix I) are higher than the observed data points, the model overestimates tissue concentrations. This is conservative given the uncertainties involved in the model estimates. The different species of plants and invertebrates are represented by the same symbol in the graphs. This allows visual identification of the range of interspecific variability expected.

The analytes that were modeled are discussed briefly by chemical class below.

Dioxins/Furans—Four dioxin/furan compounds—total octachlorodibenzodioxin (Total OCDD), total tetrachlorodibenzodioxin (Total TCDD), total tetrachlorodibenzofuran (Total TCDF), and total heptachlorodibenzodioxin (Total HpCDD)—were modeled for uptake from soil into plants and invertebrates, and from soil and plants into jackrabbits. Modeling of dioxins and furans

resulted in a higher degree of uncertainty as a result of higher detection limits for soils relative to biota and the presence of many nondetects in the data.

In order to simplify evaluation of the remaining dioxin compounds and to provide Cterms for intakes at SWMUs lacking biota data, a general dioxin model was constructed to provide a worst-case estimate of the dioxin concentration in jackrabbits; since data were available at each study area and by ESA, estimates were not required for plants or invertebrates. Maximum uptake rates, minimum loss rates, and the maximum dioxin Cterm for soil from any ESA SWMU were used to obtain a single Cterm for jackrabbit (Cjr). The Cjr was used in the dietary ingestion equations for SWMUs lacking corresponding biota data to estimate HQs for predators of jackrabbits for the dietary ingestion pathway.

Metals—Antimony, barium, cadmium, copper, lead, mercury, selenium, and zinc were modeled for uptake from soil into plants or invertebrates, and from soil and plants into jackrabbits.

Pesticides—Two organochlorine pesticides, ppDDT and ppDDE, were modeled for uptake from soil into plants or invertebrates, and from soil and plants into jackrabbits.

Explosives—Two explosive compounds, RDX and 2,4,6-TNT, were modeled for uptake from soil into plants, and from soil and plants into jackrabbits. Invertebrates were not analyzed for explosives due to inadequate sample mass. Jackrabbits were not analyzed for explosives due to the expected metabolic degradation of these compounds in mammals. This assumption was supported by concurrence from the ETAG that the explosives would be extensively metabolized by birds and mammals (ETAG Minutes, April 1995).

PAHs—The PAH compounds were not modeled because they did not appear to be accumulating in tissues. The following observations support this assumption:

- The ratio of the sum of the PAH compounds in jackrabbits from the RSA to the sum of PAH compounds in soil from the RSA was 0.006. This indicates that PAH concentrations are lower in terrestrial biota relative to soil.

- The sum of the HQs based on dietary ingestion for predators of jackrabbits from the RSA and SWMUs 42/45 was less than 0.01. This suggests that dietary ingestion for the PAHs is an insignificant contribution to the overall HI.

Herbicides—The herbicide compounds were not modeled because they did not appear to be accumulating in tissues. The following observations support this assumption:

- There were no detections in jackrabbits.

- There were only two detects in biota other than jackrabbit, and these detects were higher at the RSA than at TEAD. The detects were in vegetation.

- The herbicides are not expected to be highly toxic to mammals or birds and are not considered to be highly persistent in the environment (Howard 1991).

7.2.2.4.2 ***Results***. The results of the terrestrial food web analysis are presented below. Refer to Appendix I for the figures that present the model output for each chemical and matrix modeled.

Dioxins/Furans

Total OCDD, total TCDD, total TCDF, and total HpCDD were modeled for uptake from soil into plants and invertebrates, and from soil and plants into jackrabbits. Intakes by raptors feeding either on terrestrial invertebrates (i.e., the American kestrel) or on jackrabbits (i.e., large raptors) were predicted from the modeled tissue concentrations in plants, invertebrates, and jackrabbits. Four plant species (sweetclover, ambrosia, gumweed, and rabbitbrush), two invertebrate types (grasshoppers, beetles), and jackrabbit provided tissue data with which to calibrate and validate the model. The different species of plants and invertebrates are represented by the same symbol in the graphs. This allows visual identification of the range of interspecific variability expected. Table 7-2 presents the parameters used in the dioxin/furan bioaccumulation model for the dioxin compounds modeled. Because there are 25 dioxin/furan compounds and jackrabbits were not collected at every SWMU, a "worst-case" dioxin model for jackrabbits was compiled from the model parameters in Table 7-2 and the maximum Cterm for dioxins in ESA SWMU soils. The model output Cterms for jackrabbit for TCDD OCDD, TCDF, and HpCDD at the ESA SWMUs were used to calculate HQs. Those same model outputs were also used to represent the Cterms for total TCDD, total TCDF, and total HpCDD. The "worst-case" Time0 model result for a dioxin Cterm in jackrabbit was used for all other dioxins/furans. This was done to derive the dietary ingestion estimates necessary to predict HQs for the ingestion pathway. All HQ calculations, whether based on modeled or actual tissue data, incorporated the appropriate TEF.

Total TCDD—TCDD was detected in soils, where the number of detections/total number of samples analyzed is presented in parentheses, from SWMU 10 (2/2), SWMU 15 (3/3), SWMU 37 (1/2), and SWMU 42 (1/9). TCDD was not detected in soils from the other ESA SWMUs or the RSA. TCDD was detected in plants at SWMU 15 (2/6), SWMU 1b (1/4), SWMU 1c (1/4), SWMU 37 (3/5), SWMU 42 (6/18), SWMU 45 (3/11), and the RSA (11/37). TCDD was detected in beetles at SWMUs 21/37 (1/2), not in jackrabbits from the RSA, but was detected in jackrabbits from SWMU 45 (1/15). Summary statistics for biota and soils are presented in Appendix I for the ESA SWMUs and the RSA. The TCDD model results relative to observed concentrations in plants (PLNT), invertebrates (BUG), and jackrabbit (JR) are presented in Appendix I.

TCDD appears ubiquitous in the TEAD vicinity, as exemplified by its presence in biota at the RSA. Highest TCDD concentrations were observed in rabbitbrush. Concentrations of TCDD appeared higher in beetles than in grasshoppers, perhaps because of soil adherence, food preference, statistical or analytical aberration, or bioaccumulation.

Table 7-2. Parameters Used in the Dioxin/Furan Food Web Bioaccumulation Model

Parameter	Total TCDD	Total OCDD	Total TCDF	Total HpCDD	DIOX	Definition	Note	Units
Csoil	–	–	–	–	0.000495[a]	Average site specific soil concentrations	Varies	mg/kg[b]
DIR	0.1	0.1	0.1	0.1	0.1	daily dietary ingestion rate for jackrabbits	Fixed	kg/kg[c] bw/day
AFjr	0.1	0.1	0.1	0.15	0.15	assimilation fraction for jackrabbits	Varies	unitless
SIR	2.06E-03	2.06E-03	2.06E-03	2.06E-03	2.06E-03	daily soil ingestion rate for jackrabbits	Fixed	kg/kg bw/day
Kel	0.04	0.04	0.04	0.04	0.04	loss rate for jackrabbits	Varies	1/day
k1	0.01	0.015	0.005	0.025	0.03	uptake rate for plants	Varies	1/day
k2	0.2	0.1	0.2	0.2	0.1	loss rate for plants	Varies	1/day
AUFjr	1	1	1	1	1	area use factor for jackrabbit	Fixed	unitless
INTK	0.3	0.3	0.3	0.3	0.3	daily dietary ingestion rate for raptors	Fixed	kg/kg bw/day
AUFr	1	1	1	1	1	area use factor for raptors	Fixed	unitless
k1bug	0.01	0.001	0.001	0.02	NA[d]	uptake rate for invertebrates	Varies	1/day
k2bug	0.5	0.5	0.5	0.5	NA	loss rate for invertebrates	Varies	1/day

[a]Maximum dioxin or furan Cterm soil concentration in mg/kg for any SWMU; used to obtain a worst-case Cterm for jackrabbit.
[b]Milligrams per kilogram.
[c]Kilograms per kilogram, body weight per day.
[d]Not applicable.

Table 7-3 presents the results of the model-fitting test for total TCDD. In general, the model predicts biota tissue concentrations within a factor of 5 for all locations. The model results for invertebrates are lower than the observed concentrations in invertebrates at the RSA, and the model results for plants are higher than those observed at SWMU 15 by more than a factor of 6. At the RSA, concentrations of TCDD vary by two orders of magnitude in invertebrates; thus, it is not surprising that the model fit is not close. The model should be adequate to predict dietary intakes of TCDD at other SWMUs.

Total OCDD—OCDD was modeled because it was detected more frequently in soil or biota than the other dioxin/furans. OCDD was detected in soils at all ESA SWMUs except SWMUs 10 and 12. OCDD was detected only once in the 16 soil samples collected at the RSA. OCDD was frequently detected in plants and jackrabbits; at least one plant species from every study area, and the RSA, contained OCDD. In addition, all of the jackrabbit samples from SWMU 45, and 7 percent (1/15) of those from the RSA, contained OCDD. OCDD was detected less frequently in invertebrates. Summary statistics for biota and soils are presented in Appendix I for the SWMUs and the RSA. The model results relative to observed concentrations in plants (PLNT), invertebrates (BUG), and jackrabbit (JR) are also presented in Appendix I.

The model is more variable relative to the observed data for OCDD than TCDD (Table 7-3) for all biological media. The fit with the observed data for the invertebrates was the poorest, and the model underestimated invertebrate concentrations at nearly every study area. In contrast, the model overestimated plant concentrations at nearly every SWMU and is, therefore, fairly conservative for predicting dietary intakes for herbivores. OCDD was not detected in invertebrates from the RSA, which was the data set used to calibrate uptake and loss rates for invertebrates in the model. Therefore, it is possible that this skewed the remaining predictions. In contrast, OCDD was quite high in invertebrates from SWMUs 10/11 and in invertebrates from SWMUs 12/15.

Total TCDF—TCDF was not detected in soils from any of the study areas sampled. TCDF was detected infrequently in jackrabbits from both the RSA (6.25 percent) and SWMU 45 (6.25 percent). TCDF was frequently detected in plants from all locations. TCDF was only detected in beetles from SWMUs 10/11 and 21/37. Summary statistics for biota and soils are presented in Appendix I for the SWMUs and the RSA. The model results relative to observed concentrations in plants (PLNT), invertebrates (BUG), and jackrabbit (JR) are also presented in Appendix I. The model is more variable relative to the observed data for TCDF than TCDD (Table 7-3) for invertebrates. The model underestimated invertebrate concentrations at nearly every study area. In contrast, the model predicted plant concentrations within a factor of 3.3 or less at every SWMU and is, therefore, fairly accurate for predicting dietary intakes for herbivores. TCDF was not detected in invertebrates from the RSA, which is the data set used to calibrate the model. Therefore, it is possible that this skewed the remaining predictions. In contrast, TCDF was quite high in invertebrates (beetles) from SWMUs 10/11. Since high beetle concentrations were observed for other dioxins at SWMUs 10/11, it is possible that this sample was contaminated with soil or that the beetles collected from SWMUs 10/11 did contain high dioxin levels.

Table 7-3. Model Fitting Results for Dioxins/Furans—300 Days Divided by Average Observed Values for Each Medium

		SWMU[a]										
Chemical	**Variable**	**RSA[b]**	**1b**	**1c**	**10**	**11**	**12**	**15**	**21**	**37**	**42**	**45**
Total TCDD	Cplant	4.6	5.0	2.9	5.1	-1.1	3.6	15.6	4.0	5.35	3.1	4.3
	Cbug	-38.9	1.5	1.6	1.1	-3.75	-3.3	1.1	-2.0	-1.59	1.3	1.8
	Cjr	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.5
OCDD	Cplant	8.8	16.2	5.8	-1.6	31.4	1.3	28.1	-2.9	5.4	8.9	44.6
	Cbug	-4.2	-18.9	-69.0	-1550.5	-30.0	-540.2	-4.1	-7.5	1.2	1.1	3.8
	Cjr	15.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.7
Total TCDF	Cplant	1.0	1.2	-1.3	-3.3	1.1	-2.0	-1.2	-1.5	2.2	-1.3	1.7
	Cbug	-10.4	-7.5	-8.3	-1759.9	-887.8	-35.0	-32.3	-17.7	-20.2	-13.1	-5.3
	Cjr	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.4
Total HpCDD	Cplant	1.3	-2.69	1.23	-1.7	3.17	2.36	5.62	-12.7	2.8	14.3	5.42
	Cbug	-1.2	-8.95	-12.62	-145.0	-31.1	-11.31	2.48	-48.1	1.3	8.8	2.9
	Cjr	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	-5

[a]Solid waste management units.
[b]Reference study area.

Total HpCDD—HpCDD was detected in soils from SWMUs 11, 15, 37, and 42. HpCDD was detected in all jackrabbits from SWMU 45 but not in those from the RSA. HpCDD was frequently detected in plants from all locations, including the RSA. HpCDD was frequently detected in invertebrates from all locations except the RSA. Summary statistics for biota and soils are presented in Appendix I for the SWMUs and the RSA. The model results relative to observed concentrations in plants (PLNT), invertebrates (BUG), and jackrabbit (JR) are also presented in Appendix I.

The model is more variable relative to the observed data for HpCDD than TCDD (Table 7-3) for invertebrates. The model underestimated invertebrate concentrations at half of the study areas. In contrast, the model predicted plant concentrations within a factor of 6 or less at every SWMU except SWMUs 21 and 42. Jackrabbit concentrations were predicted within a factor of 6 at each ESA SWMU evaluated. The model, therefore, is fairly accurate in predicting dietary intakes for herbivores and carnivores.

HpCDD was not detected in invertebrates from the RSA, which is the data set used to calibrate the model. Therefore, it is possible that this skewed the model predictions. In contrast, HpCDD was quite high in invertebrates (beetles) from SWMU 10/11 and 21/37. As high beetle concentrations were observed for other dioxins at SWMU 10/11, it is possible that this sample is contaminated with soil or that the beetles collected did contain elevated dioxin levels.

Pesticides

PPDDT—PPDDT (also referred to as DDT or ppDDT) was detected in soils, where the number of detections/total number of samples analyzed is presented, from the RSA (2/16), SWMU 15 (2/3), SWMU 42 (2/9), and SWMU 45 (3/6). DDT was not detected in plants or jackrabbits from any location but was detected in both grasshoppers and beetles from TEAD. Concentrations of DDT were higher in beetles than grasshoppers, perhaps because of soil adherence, food preference, or bioaccumulation. It was detected in 30 percent of the grasshopper samples collected from the RSA but not from beetle samples. DDT appears ubiquitous in the TEAD area, as noted by its presence in soils and biota at the RSA. Summary statistics for biota and soils are presented in Appendix I for the SWMUs and the RSA. The model results relative to observed concentrations in plants (PLNT), invertebrates (BUG), and jackrabbit (JR) are also presented in Appendix I.

Table 7-4 presents the parameters used in the pesticide bioaccumulation model for the individual compounds modeled. Model results for plants deviated from observed data but were conservative in that tissue concentrations in plants were overestimated. Model results for invertebrates deviated from observed data by more than a factor of 5 at two locations. At SWMUs 11 and 42, the model underpredicted concentrations in invertebrates (Table 7-5). Mean invertebrate tissue concentrations varied by an order of magnitude or more at each of these locations, indicating that some species, but not all, would have been adequately predicted. The model overpredicted concentrations in jackrabbit at SWMU 45.

Table 7-4. Parameters Used in Food Web Bioaccumulation Model for Each Pesticide Modeled

Parameter	ppDDT[a]	ppDDE[b]	Definition	Note	Units
Csoil	--	--	Average site specific soil concentrations	Varies	mg/kg[c]
DIR	0.1	0.1	Daily dietary ingestion rate for jackrabbits	Fixed	kg/kg bw/day[d]
AFjr	0.7	0.7	Assimilation fraction for jackrabbits	Varies	unitless
SIR	2.06E-03	2.06E-03	Daily soil ingestion rate for jackrabbits	Fixed	kg/kg bw/day
Kel	0.07	0.7	Loss rate for jackrabbits	Varies	1/day
k1	0.05	0.15	Uptake rate for plants	Varies	1/day
k2	0.007	0.005	Loss rate for plants	Varies	1/day
AUFjr	1	1	Area use factor for jackrabbit	Fixed	unitless
INTK	0.3	0.3	Daily dietary ingestion rate for raptors	Fixed	kg/kg bw/day
AUFr	1	1	Area use factor for raptors	Fixed	unitless
k1bug	0.02	0.08	Uptake rate for invertebrates	Varies	1/day
k2bug	0.09	0.05	Loss rate for invertebrates	Varies	1/day

[a]2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane.
[b]2,2-Bis(p-chlorophenyl)-1,1-dichloroethene.
[c]Milligrams per kilogram.
[d]Kilograms per kilogram, body weight per day.

Table 7-5. *Model Fitting Results for Pesticides—300 Days Divided by Average Observed Values for Each Medium*

		SWMU[a]										
Chemical	Variable	RSA[b]	1b	1c	10	11	12	15	21	37	42	45
ppDDE[c]	Cplant	1.15	1.23	-1.33	1.30	-2.77	3.43	7.64	1.23	1.80	1.23	18.03
	Cbug	1.09	5.02	5.02	-1.65	-1.65	2.78	21.82	-15.01	-15.01	-6.49	1.33
	Cjr	4.66	NA[d]	NA	NA	NA	NA	NA	NA	NA	NA	49.67
ppDDT[e]	Cplant	1.15	-1.62	-1.62	-1.46	-1.62	-1.23	7.43	-1.62	-1.17	-1.86	19.82
	Cbug	1.86	1.81	1.81	-3.76	-6.96	-3.94	3.06	-2.87	-2.87	-9.57	1.58
	Cjr	1.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	17.96

[a]Solid waste management unit.
[b]Reference study area.
[c] 2,2-Bis(p-chlorophenyl)-1,1-dichloroethene.
[d]Not available.
[e]2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane.

PPDDE—PPDDE (also referred to as DDE or ppDDE) was detected in soils, where the number of detections/total number of samples analyzed is presented from the same locations where DDT was detected: SWMU 15 (1/3) and SWMU 42 (1/9). DDE was detected in plants and jackrabbits at the RSA and some of the TEAD SWMUs. DDT was detected in beetle samples at ESA SWMUs, but DDT was not detected in beetles from the RSA. DDT was detected in grasshoppers at SWMUs 21/37 and 42/45 and was detected in all three grasshopper samples from the RSA. DDE was detected in beetle samples from all the ESA SWMUs except SWMUs 12/15. DDE was detected in all three of the beetle samples from the RSA. DDE was detected in grasshoppers only at SWMUs 42/45. This suggests that perhaps these different invertebrate taxa may metabolize these pesticides differently. Concentrations of DDE were higher in beetles than grasshoppers, perhaps because of soil adherence, food preference, or bioaccumulation. PPDDE appears ubiquitous in the TEAD vicinity because of its presence in soils and biota at the RSA. Summary statistics for biota and soils are presented in Appendix I for the SWMUs and the RSA. The model results relative to observed concentrations in plants (PLNT), invertebrates (BUG), and jackrabbit (JR) are also presented in Appendix I.

Table 7-5 presents the results of the model fitting test for DDE. In general, the model predicts biota tissue concentrations within a factor of 5 relative to the measured data. Model results for plants deviated from the observed data by more than a factor of 5 at only two locations, SWMUs 15 and 45. At both locations, the model was conservative in that tissue concentrations in plants were overestimated. Model results for invertebrates deviated from observed data by more than a factor of 5 at four locations. At SWMUs 21, 37, and 42, the model underpredicted concentrations in invertebrates (Table 7-5), whereas the model overpredicted concentrations in invertebrates at SWMU 15. The model overpredicted concentrations in jackrabbit at SWMU 45.

One reason that the model does not represent the DDE data at all locations could be because DDE was below detection in all soil samples from the RSA, which was the data set used to develop the model. A value of 1/2 the detection limit of DDE in soil was therefore used to develop the model for DDE. Consequently, the actual RSA soil concentrations are uncertain.

Inorganics

The inorganics that were modeled were those for which any bioaccumulation factor (BAF), as defined by the concentration in each biotic matrix divided by the concentration in soil, exceeded 0.5 at any of the ESA SWMUs or the RSA. BAFs for at least one receptor for antimony, barium, cadmium, copper, lead, mercury, selenium, and zinc exceeded 0.5 in at least one area. These eight inorganics were modeled for uptake from soil into plants or invertebrates, and from soil and plants into jackrabbits. The model parameters are presented in Table 7-6. Intakes by raptors feeding either on terrestrial invertebrates (i.e., the American kestrel) or on jackrabbits (i.e., eagles) were predicted from the modeled tissue concentrations in lower trophic levels. Modeled inorganic jackrabbit Cterms were used to calculate dietary intakes at all ESA SWMUs except SWMUs 42/45 where jackrabbits were collected; 1/2 the MDL was used for the Cterm where specific inorganics were not modeled (i.e., Al, As, Ag,

Table 7-6. Parameters Used in Food Web Bioaccumulation Model for Each Inorganic Modeled

Parameter	Antimony	Barium	Cadmium	Copper	Lead	Mercury	Selenium	Zinc	Definition	Note	Units
Csoil	–	–	–	–	–	–	–	–	Average site specific soil concentrations	Varies	mg/kg[a]
DIR	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	daily dietary ingestion rate for jackrabbits	Fixed	kg/kg[b] bw/day
AFjr	0.15	0.2	0.15	0.06	0.6	0.06	0.9	0.5	assimilation fraction for jackrabbits	Varies	unitless
SIR	2.06E-3	2.06E-3	2.06E-3	2.06E-3	2.06E-3	2.06E-3	2.06E-3	2.06E-3	daily soil ingestion rate for jackrabbits	Fixed	kg/kg bw/day
Kel	0.015	0.04	0.03	0.01	0.009	0.01	0.07	0.03	loss rate for jackrabbits	Varies	1/day
k1	0.3	0.02	0.02	0.02	0.01	0.02	0.8	0.025	uptake rate for plants	Varies	1/day
k2	0.4	0.08	0.05	0.05	0.2	0.05	0.6	0.05	loss rate for plants	Varies	1/day
AUFjr	1	1	1	1	1	1	1	1	area use factor for jackrabbit	Fixed	unitless
INTK	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	daily dietary ingestion rate for raptors	Fixed	kg/kg bw/day
AUFr	1	1	1	1	1	1	1	1	area use factor for raptors	Fixed	unitless
k1bug	0.3	0.03	0.2	0.2	0.01	0.2	0.6	0.07	uptake rate for invertebrates	Varies	1/day
k2bug	0.8	0.8	0.5	0.15	0.5	0.5	0.8	0.0433	loss rate for invertebrates	Varies	1/day

[a]Milligrams per kilogram.
[b]Kilograms per kilogram, body weight per day.

Be, Co, Cr, Fe, Mn, Ni, V) and where tissue data were not available (i.e., all ESA SWMUs except SWMUs 42/45).

Four plant species (sweetclover, ambrosia, gumweed, and rabbitbrush), two types of invertebrates (grasshoppers, beetles), and jackrabbit provided tissue data with which to calibrate and validate the model.

Antimony—Mean modeled antimony concentrations in plants and invertebrates showed good agreement with the observed plant and invertebrate data where soil concentrations were within an order of magnitude of those at the RSA (i.e., SWMUs 10, 12, 1b, 1c, 37, and 45). At these locations, the modeled and the observed data were within a factor of 3 (Table 7-7). However, as antimony concentrations in soil increased, the model fit decreased such that predicted antimony concentrations were in excess of observed data.

Uptake rates of 15 percent were reported for mice (Jorgensen et al. 1991). This value was used as the basis for assimilation by jackrabbits; adequate representation of observed jackrabbit tissue concentration at the RSA was obtained using 0.15 as the uptake rate (Table 7-6).

Barium—Mean modeled barium concentrations in plants and invertebrates showed good agreement at all locations. At all locations except SWMU 15, the modeled and the observed data were within a factor of 5 (Table 7-7).

Cadmium—The model predicted average tissue concentrations in plants within a factor of 3 at all locations except SWMUs 11 and 42 (Table 7-7). The model overpredicted cadmium content in plants at these two locations. Therefore, the model behaved in a conservative manner. The model can be used to make risk estimates for locations without plant data.

The model predicted average concentrations in invertebrates within a factor of 5 at all sites except SWMUs 15 and 21 (Table 7-7). At these two locations, the model overpredicted cadmium content in invertebrates. Therefore, the model behaved in a conservative manner.

The model can be used to make risk estimates for locations without invertebrate data. Lindqvist and Block (1994) observed excretion rates of cadmium and zinc in grasshoppers. Terrestrial invertebrates excreted cadmium rapidly; within 12 days after dosing, nearly the entire body burden of cadmium was eliminated. As presented on a graph of cadmium loss data, approximately 10 percent of the original body burden remained at day 9.

Assuming a simple first order relationship, a derivation of the loss rate is obtained from the following exponential equation:

$$C_t=C_0e^{-kt} \qquad \text{(Equation 7-12)}$$

Table 7-7. Model Fitting Results for Inorganics—300 Days Divided by Intertaxon Average (Average of Observed Means for Each Species in Each Group)

Chemical	RSA[a]	SWMU[b] 1b	SWMU 1c	SWMU 10	SWMU 11	SWMU 12	SWMU 15	SWMU 21	SWMU 37	SWMU 42	SWMU 45
Antimony											
Cplant	1.23	1.81	1.79	1.82	55.09	2.82	13.77	7.43	1.30	244.35	2.15
Cbug	1.57	1.04	1.04	-1.36	23.97	2.96	11.34	47.80	1.82	211.00	1.42
Cjr	1.05	NA[c]	NA	NA[c]	NA	NA	NA	NA	NA	NA	2.37
Barium											
Cplant	1.42	2.36	3.48	1.65	4.32	5.13	6.00	1.36	1.23	-1.38	2.79
Cbug	1.08	-1.65	-1.51	-1.50	1.95	2.25	2.68	2.05	-2.22	3.72	1.47
Cjr	-1.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.80
Cadmium											
Cplant	1.02	1.15	-2.03	1.68	6.77	2.47	-1.69	1.38	1.50	5.08	2.79
Cbug	-1.12	2.76	-2.11	-1.01	3.54	1.05	5.37	6.36	-2.81	4.84	3.34
Cjr	1.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.76
Copper											
Cplant	1.04	-1.04	1.05	-4.23	8.86	-1.16	79.39	4.21	-2.18	4.10	4.37
Cbug	1.45	1.19	-1.13	-3.45	9.46	1.08	113.55	13.38	-2.18	6.30	4.70
Cjr	1.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	-1.18

Table 7-7. *Model Fitting Results for Inorganics—300 Days Divided by Intertaxon Average (Average of Observed Means for Each Species in Each Group) (continued)*

Chemical	RSA[a]	SWMU[b] 1b	SWMU 1c	SWMU 10	SWMU 11	SWMU 12	SWMU 15	SWMU 21	SWMU 37	SWMU 42	SWMU 45
Lead											
Cplant	1.02	1.57	1.14	-4.92	69.12	2.65	4.27	-2.92	-2.24	-1.06	7.58
Cbug	1.09	-1.22	-2.14	-8.74	46.15	2.42	4.45	1.20	-62.98	4.76	2.33
Cjr	-1.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.38
Mercury											
Cplant	1.20	1.15	1.35	1.28	3.28	1.34	16.87	1.92	1.32	2.32	3.87
Cbug	1.24	-1.75	-1.75	1.13	2.30	-1.40	8.94	-1.17	-1.93	1.36	2.12
Cjr	-2.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.02
Selenium											
Cplant	1.07	1.23	1.20	1.22	1.22	1.15	1.99	1.21	1.22	1.58	-1.09
Cbug	1.29	-2.22	-2.22	1.20	1.20	1.17	2.04	-1.23	-1.23	1.49	1.06
Cjr	-1.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.20
Zinc											
Cplant	1.52	1.14	1.02	-2.10	26.10	1.24	1.95	2.27	-1.11	1.96	7.34
Cbug	1.14	2.67	1.46	-1.44	30.32	1.51	7.98	8.82	1.26	1.72	6.56
Cjr	1.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	-1.28

[a]Reference study area.
[b]Solid waste management unit.
[c]Not available.

Substituting day 9 for time t, 10 percent for C_t, and 100 percent for C_0 yields:

$$10=100e^{-k*9} \quad \text{(Equation 7-13)}$$

Solving for k, the loss rate, provides an estimate of 0.26.

While lower than the loss rate of 0.5 day^{-1} predicted from the TEAD data, this is not inconsistent with the loss rate value of 0.5 for invertebrates estimated from the TEAD data from the model, which include beetles as well as grasshoppers. Lindqvist and Block (1994) indicate that most cadmium is excreted with the feces as opposed to being transported across gut epithelium; gut epithelium is shed into the intestinal lumen, further excreting cadmium. The amount that is absorbed or assimilated was not obtainable from the data presented in the paper.

Other estimates of cadmium kinetics are available for invertebrates. Crommentuijn et al. (1994) investigated cadmium toxicity and kinetics in six arthropod species that included two collembolan, one oribatid mite, one diplopod, and two isopod species. Cadmium exposure was through the diet, which could alter the results in comparison to soil, and was expressed on a dry weight basis. The uptake rates (± standard deviation) from this study ranged from 0.0027 ± 0.0001 to 0.027 ± 0.0041 day^{-1}, and the loss rates range from 0 to 0.0478 ± 0.0140 day^{-1}. Table 7-8 presents a summary of the uptake and loss rates from this study. These rates are lower than those observed by Lindqvist and Block (1994) for grasshoppers and indicate that different invertebrates may metabolize cadmium differently. The collembolans and oribatids have higher loss rates than uptake rates, as predicted by the model for grasshoppers and beetles at TEAD. However, the isopods and diplopods have minimal to no excretion of cadmium. Isopods contained the highest dry weight cadmium concentrations of the microarthropods studied: nearly 1,000 mg/kg. The diplopod contained concentrations similar to the collembolans and oribatids, which excrete cadmium, possibly because the uptake rate was so low. Therefore, while some groups of invertebrates may have higher cadmium concentrations than those modeled, the proportion is likely to be low (two isopod species/nine micro- and macroinvertebrates for which data are cited, including the two TEAD taxa and the Lindqvist and Block (1994) orthopteran, or 22 percent).

Postma and others (1996) investigated cadmium excretion in the midge (*Chironomus riparius*). They found more than 80 percent of the cadmium was associated with the gut. Cadmium-adapted populations exhibited decreased accumulation, and increased excretion, relative to non-adapted populations. Uptake rates ranged from 0.254 to 0.637 day^{-1}, and loss rates ranged from 0.131 to 0.359 day^{-1} on a dry weight basis. Equilibrium concentrations were reached within 4 to 6 days. The TEAD model makes similar predictions for the time to equilibrium for invertebrates (Appendix I). Thus, the model is adequate to predict cadmium concentrations in invertebrates and the resulting dietary ingestion by insectivores.

Table 7-8. Mean (±Standard Deviation) Cadmium Uptake and Loss Rates for Soil Arthropods

Order	Species	Uptake Rate (k_1) (day $^{-1}$)	Loss Rate (k_2) (day $^{-1}$)
Collembola	*Orchesella cincta*	0.0095 ± 0.0005	0.0478 ± 0.0140
	Tomocerus minor	0.0063 ± 0.0003	0.0065 ± 0.0070
Oribatida	*Platynothrus peltifer*	0.0120 ± 0.0001	0.0171 ± 0.0071
Isopoda	*Porcellio scaber*	0.0189 ± 0.0021	0
	Oniscus asellus	0.0270 ± 0.0041	0
Diplopoda	*Cylindroiulus britannicus*	0.0027 ± 0.0001	0

Source: Crommentuijn et al. 1994

The model predicted average concentrations in jackrabbits within a factor of 4 at all sites (Table 7-7). There are fewer data points to validate the model behavior, which makes use of the model for predicting mammal concentrations more uncertain. However, the model did overpredict the tissue concentrations and, hence, is acting in a conservative manner. The model could have been used to make risk estimates for locations without jackrabbit data.

Copper—The model predicted average tissue concentrations in plants at all sites except SWMUs 11 and 15 within a factor of 4.4 (Table 7-7). The model overpredicted copper content in plants by over an order of magnitude at SWMU 15. The soil concentrations at SWMU 15 varied over an order of magnitude, from a minimum of 18.9 mg/kg to a maximum of 3,800 mg/kg; this maximum was the highest soil concentration of copper detected at TEAD ESA SWMUs, which could have influenced the results. The model behaves conservatively in most cases, although at SWMU 10 the model underpredicts the observed mean by a factor of approximately 4. The model can therefore be used to make risk estimates for locations without plant data.

The model predicted average concentrations in invertebrates within a factor of 3.5 at all sites except SWMUs 11, 15, 21, 42, and 45 (Table 7-7). At these locations, the model overpredicted copper content in invertebrates by a factor of 4.7 or higher. Therefore, the model behaved in a conservative manner. The model can be used to make risk estimates for locations without invertebrate data. The model predicted average concentrations in jackrabbit at SWMU 45 within a factor of 2.2.

Lead—The model predicted average tissue concentrations in plants at most sites within a factor of 5. At SWMUs 11 and 45, the model overpredicted the plant concentrations (Table 7-7).

The model predicted average tissue concentrations in invertebrates at most sites within a factor of 5. At SWMU 11, the model overpredicted invertebrate concentrations (Table 7-7). At

SWMUs 10 and 37, however, invertebrate concentrations were underpredicted. At SWMU 37, the model predicted maximum concentrations of 0.1 mg/kg, whereas observed concentrations ranged from 0.8 to 14 mg/kg.

The model predicted average concentrations in jackrabbit at SWMU 45 within a factor of 2. Although high lead concentrations were observed in jackrabbit whole body, the concentrations were low relative to soils.

Loss rates were available from literature data for half-life for rat, human, mussel, and oyster (Jorgensen et al. 1991). The half-life of lead in rat ranged from 18 to 109 days, whereas the half-life in human (whole body) was estimated at 5 years. Loss rate can be estimated from the half-life using the following equation:

$$Loss\ rate\ = \frac{\ln\ 0.5}{half\text{-}life\ (days)} = \frac{0.693}{half\text{-}life\ (days)} \qquad \text{(Equation 7-14)}$$

Equation 7-14, with the estimate of half-life above, provided estimates for a Kel of 0.0064 to 0.04 day^{-1} for rats and 0.00038 day^{-1} for humans. The value of 0.009 day^{-1} used in the model for jackrabbit fell within the observed range for rats and humans. Substituting the half-life of 43.2 to 102 days for mussel into Equation 7-14, results in an estimated range for loss rate (k2bug) of 0.0068 to 0.016 day^{-1}. Substituting the half-life of 13.2 to 143.0 days for oyster provides an estimate for k2bug of 0.0048 to 0.052 day^{-1} for oyster. The estimates of excretion or loss rate for aquatic invertebrates were lower by an order of magnitude than the 0.5 predicted by the TEAD data for terrestrial invertebrates.

Mercury—The model predicted average tissue concentrations in plants at all sites within a factor of 4 except for SWMU 15 (Table 7-7). The model overpredicted mercury content in plants at this location by over an order of magnitude. The model predicted average concentrations in invertebrates within a factor of 2.5 at all sites except SWMU 15 (Table 7-7). At this location, the model overpredicted mercury content in invertebrates by a factor of 8.9. Therefore, the model behaved in a conservative manner. The model can be used to make risk estimates for locations without invertebrate data. The model predicted average concentrations in jackrabbit within a factor of 2 at SWMU 45.

Selenium—Selenium was detected in soil only at SWMUs 15 and 42. However, there were detections in invertebrates; selenium was detected in jackrabbits from the RSA but not from SWMU 45. The model fit was good for all biotic matrices at all locations (Table 7-7).

Data for rat and human indicated uptake ranging from 80 to 97.5 percent relative to diet (Jorgensen et al. 1991). These data were used to begin calibration for jackrabbit, and the final k1 value that yielded the best model fit for jackrabbit fell within this range.

Zinc—The model predicted average tissue concentrations in plants at all sites except SWMUs 11 and 45 within a factor of 2.3 (Table 7-7). The model overpredicted zinc content in plants

at SWMUs 11 and 45. The soil concentrations at these two SWMUs exceeded 200 mg/kg; SWMU 11 had an arithmetic mean of 843 mg/kg and SWMU 45 232.7 mg/kg. From these data, it can be surmised that plants regulate zinc uptake, such that at high soil concentrations, the relative bioaccumulation factor is lower. The plant uptake rate is likely to vary with soil concentration; this indicates that a higher order equation might represent the data better than the first order equation used in the model. The model can be used to make risk estimates for zinc ingestion by herbivores at locations without plant data but may overestimate dietary zinc exposure. The model is unlikely to underestimate intake.

The model predicted average concentrations in invertebrates within a factor of 2.7 at all sites except SWMUs 11, 15, 21, and 45 (Table 7-7). At these locations, the model overpredicted zinc content in invertebrates. Therefore, the model behaved in a conservative manner. At each of these locations, mean soil content exceeded 200 mg/kg. The model can be used to make risk estimates for locations without invertebrate data.

Lindqvist and Block (1994) observed that grasshoppers retained 50 percent of the zinc ingested as part of the diet. The grasshoppers given zinc (up to 0.360 μg) had higher body weights. Grasshoppers weighed approximately 35 mg; therefore, this is an estimated dose of 10.3 mg/kg body weight. Orthopterans can control uptake and excretion of zinc, but not cadmium (Lindqvist and Block 1994). Thus, body content is more likely to vary with soil contamination for cadmium than zinc, as illustrated by data from Hunter and others (1987), and Joose and Van Vliet (1982). These data show that cadmium concentrations varied with soil contamination, but zinc concentrations in grass were not related to grasshopper zinc concentration. Terrestrial invertebrates require zinc, which is present in hemolymph and many enzymes, and also provides structural support for mandibles (Lindqvist and Block 1994). From a graph in Lindqvist and Block (1994), a loss rate for grasshoppers was estimated. At day 14, the zinc content of grasshoppers was approximately 50 percent of that exhibited at the start of the elimination period. Substituting the time (14 days) into Equation 7-12, and solving for k, results in a loss rate of -0.0495 day $^{-1}$. This loss rate is similar to that obtained for zinc for the TEAD data. The model predicted average concentrations in jackrabbit within a factor of 2.

Explosives

The explosive compounds RDX and 2,4,6-TNT were modeled. The model parameters are presented in Table 7-9. Explosives were not analyzed in invertebrate or jackrabbit tissue; therefore, the model is calibrated with plant tissue concentrations. Jackrabbit tissue concentrations were predicted, as well as raptor intakes, but these estimates cannot be validated. Neither RDX or 2,4,6-TNT were detected in soil samples collected from the study areas at TEAD or from the RSA. Detection limits in soil were 0.64 mg/kg for RDX and 1 mg/kg for 2,4,6-TNT. Therefore, all model results are the same at each site.

Observed plant data were plotted against the model predictions at each site (Appendix I). It is readily apparent from these figures that the plant concentrations are widely variable; this is in

Table 7-9. Parameters Used in the Food Web Bioaccumulation Model for Explosives Modeled

Parameter	RDX	2,4,6-TNT	Definition	Note	Units
Csoil	–	–	Average site specific soil concentrations	Varies	mg/kg[a]
DIR	0.1	0.1	daily dietary ingestion rate for jackrabbits	Fixed	kg/kg bw/day[b]
AFjr	0.5	0.5	assimilation fraction for jackrabbits	Varies	unitless
SIR	2.06E-3	2.06E-3	daily soil ingestion rate for jackrabbits	Fixed	kg/kg bw/day
Kel	0.7	0.7	loss rate for jackrabbits	Varies	1/day
k1	0.5	0.5	uptake rate for plants	Varies	1/day
k2	0.05	0.05	loss rate for plants	Varies	1/day
AUFjr	1	1	area use factor for jackrabbit	Fixed	unitless
INTK	0.3	0.3	daily dietary ingestion rate for raptors	Fixed	kg/kg bw/day
AUFr	1	1	area use factor for raptors	Fixed	unitless
k1bug	NA	NA	uptake rate for invertebrates	Varies	1/day
k2bug	NA	NA	loss rate for invertebrates	Varies	1/day

[a]Milligrams per kilogram.
[b]Kilograms per kilogram, body weight per day.

part an artifact of the analytical methods, as detection limits varied by species for the munition compounds.

In general, the model fit the observed data for both RDX and 2,4,6-TNT (Table 7-10). The exception is RDX at SWMU 10, where the model underpredicts the plant concentrations by a factor of over 40. The data for vegetation were quite variable at this SWMU. RDX concentrations in gumweed ranged from 3.95 to 130 mg/kg, whereas RDX in rabbitbrush ranged from 58 to 850 mg/kg. Given this variability in the underlying data, model behavior was good.

7.2.2.4.3 *Conclusions*. In most cases, the model was able to predict concentrations in biota from concentrations in soil within a factor of 5. This is adequate for use in the risk assessment. The model parameters were conservatively adjusted such that overpredictions occurred more often than underestimates.

7.2.2.5 *Exposure Intakes*

Exposure intakes (or doses), which are equivalent to a daily dose normalized to body weight, were calculated using the RME scenario, which included Cterms represented by the lesser of the arithmetic UCL95 or maximum value and the 95th percentile exposure parameters (see Table 7-1).

7.2.2.5.1 *Exposure Intakes for the RSA and TEAD SWMUs*. Exposure intakes (or doses) were calculated for each media by multiplying the exposure point concentration (i.e., Cterm) by the media ingestion rate and by the AUF:

(Equation 7-15)

$$\text{Exposure Intake} = \text{Media Ingestion Rate} * \text{Cterm} * \text{AUF}$$

7.2.2.5.2 *Exposure Intakes - Soil Ingestion Pathway*. Exposure intakes (or doses) for the soil ingestion pathway were calculated from soil data for each COPC by SWMU and the RSA. Intakes were estimated by multiplying the Cterm soil concentration (mg/kg) by the soil ingestion rate (kg soil/kg bw/day) and the AUF to obtain mg/kg bw/day as follows:

(Equation 7-16)

$$\text{Exposure Intake}_{\text{mg/kg bw/day}} = \text{Soil Ingestion Rate}_{\text{(kg soil/kg bw/day)}} * \text{Soil Cterm}_{\text{(mg/kg soil)}} * \text{AUF}$$

Table 7-10. *Model Fitting Results for Explosives—300 Days Divided by Average Observed Values for Each Medium*

		SWMU[a]										
Chemical	**Variable**	**RSA[b]**	**1b**	**1c**	**10**	**11**	**12**	**15**	**21**	**37**	**42**	**45**
RDX	Cplant	1.65	1.12	1.11	-41.67	1.15	1.79	1.74	1.15	1.69	1.80	1.30
2,4,6-TNT	Cplant	2.06	2.06	2.14	1.18	2.08	6.97	2.38	1.44	3.09	3.36	2.84

[a]Solid waste management unit.
[b]Reference study area.

Soil ingestion rates were summarized in Table 7-1 for each receptor. The 95th percentile for ingestion rates was used to obtain exposure intakes (equivalent to doses). AUF values were taken from Appendix B and utilized the 95th percentile home range values (Table 7-1).

7.2.2.5.3 *Exposure Intakes - Surface Water Ingestion Pathway*. Surface water intakes (or doses) were calculated by multiplying the daily water ingestion rate (Table 7-1) by the maximum surface water concentration of each analyte. Surface water ingestion was estimated for the receptors most likely to consume surface water. Small mammals, such as deer mice, which likely meet their water requirements through diet, were excluded from the surface water ingestion pathway. Because most of the species at TEAD are adapted to existing in an arid climate, surface water ingestion exposure estimates are likely to be highly conservative.

The surface water ingestion pathway was evaluated for terrestrial birds and animals at the locations where surface water data were available (SWMUs 11, 21, 23, and 45), except for SWMU 14, which was evaluated separately as an aquatic ecosystem. For the purposes of the exposure analysis, it was assumed that passerines, raptors, jackrabbits, mule deer, and kit foxes would drink surface water but that the small mammals would not. The water ingestion rates for the taxa listed above were provided in Table 7-1. Chemical intake (or dose) is the product of the ingestion rate and the concentration in water. For the initial screening, AUFs were not applied because it was assumed that numerous home ranges could overlap at an isolated water source and that the isolated water source could well serve entire subpopulations.

The daily intake (or dose) of chemicals in surface water at SWMUs 11, 21, 23, and 45 are presented in Tables 7-11 through 7-13. These intakes are likely to be overly conservative because the water sources are intermittent and may not provide a chronic source of exposure. In addition, because of the low frequency of detection as well as the few samples collected, maximum detected values were used as the Cterm.

7.2.2.5.4 *Exposure Intakes - Direct Contact Pathway*. Potential ecotoxicological effects to plants and invertebrates were quantified by comparing the soil concentration to the appropriate TBV for these taxa. For the risk assessment, dermal absorption by birds and mammals was assumed to be an insignificant exposure pathway. Many of the analytes are metals, which are not readily transferred across intact dermal membranes.

7.2.2.5.5 *Exposure Intakes - Dietary Ingestion Pathway*. Analyte concentrations in tissue were available for selected plants, beetles, grasshoppers, and jackrabbits. Thus, dietary intakes (or doses) for both carnivores and herbivores were quantified at the SWMUs and the RSA where biological data were collected. Where biota data were not collected but the risk analysis indicated a potential for ecological risk, food web modeling was used to provide quantitative estimates of dietary exposure where necessary. This situation occurred for certain analytes in jackrabbits, which were collected only at SWMU 45 and the RSA, and certain analytes in grasshoppers and beetles where sample size limitations prevented some analyses.

Table 7-11. Exposure Intakes for Birds and Mammals Ingesting Surface Water at SWMUs 11 and 21 (Laundry Effluent Ponds and the Contaminated Waste Processor)

Analyte Code	Analyte	Cterm[b] (µg/L)[c]	Receptor Specific Intake Rates mg/kg bw/day[a]								
			Passerines	American Kestrel	Great Horned Owl	Golden Eagle	Bald Eagle	Deer Mouse	Mule Deer	Jackrabbit	Kit Fox
13DCLB	1,3-Dichlorobenzene	10.06	1.34E-03	1.21E-03	1.11E-04	1.11E-04	1.11E-04	ND	2.11E-04	9.76E-04	2.82E-04
135TNB	1,3,5-Trinitrobenzene	12.26	1.63E-03	1.47E-03	1.35E-04	1.35E-04	1.35E-04	ND	2.57E-04	1.19E-03	3.43E-04
246TNT	2,4,6-Trinitrotoluene	542.66	7.22E-02	6.51E-02	5.97E-03	5.97E-03	5.97E-03	ND	1.14E-02	5.26E-02	1.52E-02
24DNT	2,4-Dinitrotoluene	6.15	8.17E-04	7.37E-04	6.76E-05	6.76E-05	6.76E-05	ND	1.29E-04	5.96E-04	1.72E-04
26DNT	2,6-Dinitrotoluene	24.72	3.29E-03	2.97E-03	2.72E-04	2.72E-04	2.72E-04	ND	5.19E-04	2.40E-03	6.92E-04
35DNA	3,5-Dinitroaniline	31.59	4.20E-03	3.79E-03	3.47E-04	3.47E-04	3.47E-04	ND	6.63E-04	3.06E-03	8.85E-04
2MNAP	2-Methylnaphthalene	2.83	3.77E-04	3.40E-04	3.12E-05	3.12E-05	3.12E-05	ND	5.95E-05	2.75E-04	7.93E-05
AL	Aluminum	819.91	1.09E-01	9.84E-02	9.02E-03	9.02E-03	9.02E-03	ND	1.72E-02	7.95E-02	2.30E-02
ANAPNE	Acenaphthene	23.69	3.15E-03	2.84E-03	2.61E-04	2.61E-04	2.61E-04	ND	4.98E-04	2.30E-03	6.63E-04
ANTRC	Anthracene	14.00	1.86E-03	1.68E-03	1.54E-04	1.54E-04	1.54E-04	ND	2.94E-04	1.36E-03	3.92E-04
AS	Arsenic	7.24	9.62E-04	8.68E-04	7.96E-05	7.96E-05	7.96E-05	ND	1.52E-04	7.02E-04	2.03E-04
B2EHP	Bis(2-ethylhexyl) phthalate	48.16	6.41E-03	5.78E-03	5.30E-04	5.30E-04	5.30E-04	ND	1.01E-03	4.67E-03	1.35E-03
BA	Barium	109.85	1.46E-02	1.32E-02	1.21E-03	1.21E-03	1.21E-03	ND	2.31E-03	1.07E-02	3.08E-03
BAANTR	Benzo[a]anthracene	144.83	1.93E-02	1.74E-02	1.59E-03	1.59E-03	1.59E-03	ND	3.04E-03	1.40E-02	4.06E-03
BAPYR	Benzo[a]pyrene	127.62	1.70E-02	1.53E-02	1.40E-03	1.40E-03	1.40E-03	ND	2.68E-03	1.24E-02	3.57E-03
BBFANT	Benzo[b]fluoranthene	141.90	1.89E-02	1.70E-02	1.56E-03	1.56E-03	1.56E-03	ND	2.98E-03	1.38E-02	3.97E-03
BGHIPY	Benzo[ghi]perylene	157.35	2.09E-02	1.89E-02	1.73E-03	1.73E-03	1.73E-03	ND	3.30E-03	1.53E-02	4.41E-03
BKFANT	Benzo[k]fluoranthene	112.30	1.49E-02	1.35E-02	1.24E-03	1.24E-03	1.24E-03	ND	2.36E-03	1.09E-02	3.14E-03
BRMCIL	Bromacil	9.26	1.23E-03	1.11E-03	1.02E-04	1.02E-04	1.02E-04	ND	1.94E-04	8.98E-04	2.59E-04
CHRY	Chrysene	115.66	1.54E-02	1.39E-02	1.27E-03	1.27E-03	1.27E-03	ND	2.43E-03	1.12E-02	3.24E-03
CR	Chromium	35.90	4.77E-03	4.31E-03	3.95E-04	3.95E-04	3.95E-04	ND	7.54E-04	3.48E-03	1.01E-03
CU	Copper	153.00	2.03E-02	1.84E-02	1.68E-03	1.68E-03	1.68E-03	ND	3.21E-03	1.48E-02	4.28E-03
DBAHA	Dibenz[ah]anthracene	22.28	2.96E-03	2.67E-03	2.45E-04	2.45E-04	2.45E-04	ND	4.68E-04	2.16E-03	6.24E-04
DBZFUR	Dibenzofuran	12.50	1.66E-03	1.50E-03	1.38E-04	1.38E-04	1.38E-04	ND	2.63E-04	1.21E-03	3.50E-04
DCLB	Dichlorobenzene - nonspecifi	3.66	4.87E-04	4.40E-04	4.03E-05	4.03E-05	4.03E-05	ND	7.69E-05	3.55E-04	1.03E-04
FANT	Fluoranthene	336.12	4.47E-02	4.03E-02	3.70E-03	3.70E-03	3.70E-03	ND	7.06E-03	3.26E-02	9.41E-03
FE	Iron	8470.00	1.13E+00	1.02E+00	9.32E-02	9.32E-02	9.32E-02	ND	1.78E-01	8.22E-01	2.37E-01
FLRENE	Fluorene	21.92	2.91E-03	2.63E-03	2.41E-04	2.41E-04	2.41E-04	ND	4.60E-04	2.13E-03	6.14E-04
HG	Mercury	0.73	9.67E-05	8.72E-05	8.00E-06	8.00E-06	8.00E-06	ND	1.53E-05	7.05E-05	2.04E-05
ICDPYR	Indeno[1,2,3-C,D]pyrene	62.67	8.34E-03	7.52E-03	6.89E-04	6.89E-04	6.89E-04	ND	1.32E-03	6.08E-03	1.75E-03
MN	Manganese	310.32	4.13E-02	3.72E-02	3.41E-03	3.41E-03	3.41E-03	ND	6.52E-03	3.01E-02	8.69E-03
NAP	Naphthalene	3.62	4.81E-04	4.34E-04	3.98E-05	3.98E-05	3.98E-05	ND	7.60E-05	3.51E-04	1.01E-04
NI	Nickel	56.71	7.54E-03	6.81E-03	6.24E-04	6.24E-04	6.24E-04	ND	1.19E-03	5.50E-03	1.59E-03
PHANTR	Phenanthrene	116.73	1.55E-02	1.40E-02	1.28E-03	1.28E-03	1.28E-03	ND	2.45E-03	1.13E-02	3.27E-03
PB	Lead	44.92	5.97E-03	5.39E-03	4.94E-04	4.94E-04	4.94E-04	ND	9.43E-04	4.36E-03	1.26E-03
PYR	Pyrene	220.51	2.93E-02	2.65E-02	2.43E-03	2.43E-03	2.43E-03	ND	4.63E-03	2.14E-02	6.17E-03
RDX	RDX / Cyclonite	19.93	2.65E-03	2.39E-03	2.19E-04	2.19E-04	2.19E-04	ND	4.19E-04	1.93E-03	5.58E-04
SB	Antimony	10.88	1.45E-03	1.31E-03	1.20E-04	1.20E-04	1.20E-04	ND	2.28E-04	1.06E-03	3.05E-04
SE	Selenium	12.40	1.65E-03	1.49E-03	1.36E-04	1.36E-04	1.36E-04	ND	2.60E-04	1.20E-03	3.47E-04
ZN	Zinc	839.25	1.12E-01	1.01E-01	9.23E-03	9.23E-03	9.23E-03	ND	1.76E-02	8.14E-02	2.35E-02

[a] Milligram per kilograms body weight per day.
[b] Concentration term.
[c] Micrograms per liter.

Table 7-12. Exposure Intakes for Birds and Mammals Ingesting Surface Water at the Bomb and Reconditioning Building (SWMU 23)

COPC[b]	Concentration (µg/L)[c]	Receptor Specific Intake Rates (mg/kg bw/day)[a] Passerines	American Kestrel	Great Horned Owl	Golden Eagle	Bald Eagle	Deer Mouse	Mule Deer	Jackrabbit	Kit Fox
Barium	79	1.05E-02	9.48E-03	8.69E-04	8.69E-04	8.69E-04	NA[d]	1.66E-03	7.66E-03	2.21E-03
Methylene chloride	14.7	1.96E-03	1.76E-03	1.62E-04	1.62E-04	1.62E-04	NA	3.09E-04	1.43E-03	4.12E-04
Chloromethane	6.76	8.99E-04	8.11E-04	7.44E-05	7.44E-05	7.44E-05	NA	1.42E-04	6.56E-04	1.89E-04
Copper	11.5	1.53E-03	1.38E-03	1.27E-04	1.27E-04	1.27E-04	NA	2.42E-04	1.12E-03	3.22E-04
Iron	780	1.04E-01	9.36E-02	8.58E-03	8.58E-03	8.58E-03	NA	1.64E-02	7.57E-02	2.18E-02
Nitrate	1800	2.39E-01	2.16E-01	1.98E-02	1.98E-02	1.98E-02	NA	3.78E-02	1.75E-01	5.04E-02
Lead	12.1	1.61E-03	1.45E-03	1.33E-04	1.33E-04	1.33E-04	NA	2.54E-04	1.17E-03	3.39E-04
Phosphate	63.1	8.39E-03	7.57E-03	6.94E-04	6.94E-04	6.94E-04	NA	1.33E-03	6.12E-03	1.77E-03
Sulfate	52000	6.92E+00	6.24E+00	5.72E-01	5.72E-01	5.72E-01	NA	1.09E+00	5.04E+00	1.46E+00
Zinc	34.8	4.63E-03	4.18E-03	3.83E-04	3.83E-04	3.83E-04	NA	7.31E-04	3.38E-03	9.74E-04

[a]Milligrams per kilograms body weight per day.

[b]Chemical of potential concern.

[c]Micrograms per liter. Concentration represents only data for this analyte (i.e., only 1 sample collected).

[d]Not applicable

Table 7-13. Exposure Intakes for Birds and Mammals Ingesting Surface Water at the Stormwater Discharge (SWMU 45)

COPC[b]	Concentration (µg/L)[c]	Receptor Specific Intake Rates (mg/kg bw/day)[a] Passerines	American Kestrel	Great Horned Owl	Golden Eagle	Bald Eagle	Deer Mouse	Mule Deer	Jackrabbit	Kit Fox
para-Cresol	1.500	2.00E-04	1.80E-04	1.65E-05	1.65E-05	1.65E-05	NA[d]	3.15E-05	1.46E-04	4.20E-05
2,4-Dinitrotoluene	2.680	3.56E-04	3.22E-04	2.95E-05	2.95E-05	2.95E-05	NA	5.63E-05	2.60E-04	7.50E-05
Arsenic	7.642	1.02E-03	9.17E-04	8.41E-05	8.41E-05	8.41E-05	NA	1.60E-04	7.41E-04	2.14E-04
Bis-2-ethylhexyl phthalate	20.000	2.66E-03	2.40E-03	2.20E-04	2.20E-04	2.20E-04	NA	4.20E-04	1.94E-03	5.60E-04
Barium	102.570	1.36E-02	1.23E-02	1.13E-03	1.13E-03	1.13E-03	NA	2.15E-03	9.95E-03	2.87E-03
Cyanide	12.153	1.62E-03	1.46E-03	1.34E-04	1.34E-04	1.34E-04	NA	2.55E-04	1.18E-03	3.40E-04
Iron	88.860	1.18E-02	1.07E-02	9.77E-04	9.77E-04	9.77E-04	NA	1.87E-03	8.62E-03	2.49E-03
Lead	1.617	2.15E-04	1.94E-04	1.78E-05	1.78E-05	1.78E-05	NA	3.40E-05	1.57E-04	4.53E-05
Toluene	0.674	8.96E-05	8.09E-05	7.41E-06	7.41E-06	7.41E-06	NA	1.42E-05	6.54E-05	1.89E-05
Manganese	55.600	7.39E-03	6.67E-03	6.12E-04	6.12E-04	6.12E-04	NA	1.17E-03	5.39E-03	1.56E-03

[a]Milligrams per kilograms body weight per day.

[b]Chemical of potential concern.

[c]Micrograms per liter. Concentration represents only data for this analyte (i.e., only 1 sample collected).

[d]Not applicable.

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Dietary ingestion was quantified by assuming that plants and invertebrates were in equilibrium with the surrounding soils. This assumption allows contaminant concentrations in biota to be related back to a soil source. The Cterms for plants, terrestrial invertebrates, and jackrabbits were calculated as the lower of the UCL95 on the arithmetic mean, or the maximum detected concentration. Data for plants were used to predict chemical intake (i.e., dose) by herbivores by multiplying the Cterm for plant ($Cterm_{plant}$) at each study area by the dietary ingestion rate and AUF for each herbivore. The Cterm for jackrabbit ($Cterm_{jr}$) was multiplied by the dietary ingestion rate and the AUF for each of the carnivores for each analyte at each SWMU. For example, for either the herbivorous mule deer or carnivorous raptor:

$$Intake_{\text{mule deer (mg/kg bw/day)}} = \text{Dietary Ingestion Rate}_{\text{mule deer}} * Cterm_{plant} * AUF_{\text{mule deer}} \quad \text{(Equation 7-17)}$$

$$Intake_{\text{bald eagle (mg/kg bw/day)}} = \text{Dietary Ingestion Rate}_{\text{bald eagle}} * Cterm_{jr} * AUF_{\text{bald eagle}} \quad \text{(Equation 7-18)}$$

Some receptor species or receptor groups at TEAD feed upon many different food items. Passerine birds are a diverse group of species that may consume vegetation, invertebrates, mammals, other birds, or even carrion. The dietary intakes (or doses) for the passerine birds were estimated using Equation 7-18:

(Equation 7-19)

$$Intake_{\text{passerine (mg/kg bw/day)}} = \text{Dietary Ingestion Rate}_{\text{passerine}} * 0.33 * (Cterm_{inv} + Cterm_{plant} + Cterm_{jr}) * AUF_{passerine}$$

For the purpose of estimating dietary intakes, it was assumed that the diet for the passerine birds included 33 percent small mammals, 33 percent vegetation, and 33 percent invertebrates. This approach represented a simplifying assumption and was meant to be conservative. There is a high rate of omnivory among desert species (van der Valk 1997), so this assumption is adequate for representing dietary preferences at TEAD. The Cterm for jackrabbit was used to predict tissue concentrations in small mammals. In actuality, the HQs were calculated before the dietary percentages were applied. This approach is mathematically equivalent to taking 33 percent of each Cterm concentration prior to derivation of HQs. The average of the analyte-receptor-specific HQs for up to four plant species sampled were used to represent concentrations in vegetation, and the average of the analyte-receptor-specific HQs for both invertebrate taxa was used to represent the invertebrate component. Although it is unlikely that many passerine bird species ingest small mammal carcass to any extent, the intent was to be protective of omnivorous birds such as shrikes, magpies, and crows. The plant data were used to represent the seed, fruit, or vegetative concentrations in the passerine diet.

USEPA Region VIII currently indicates a preference for providing separate exposure scenarios for different passerine feeding guilds (i.e., omnivore, herbivore, insectivore, and carnivore) (USEPA 1997b).

The American kestrel was assumed to ingest small mammals and terrestrial invertebrates. The jackrabbit tissue data were used to predict concentrations in small mammals, and the

grasshopper and beetle data were used to predict the concentrations in invertebrates. The dietary fractions of small mammal and terrestrial invertebrates for the American kestrel were assumed to be equal. This approach represented a simplifying assumption and was meant to be conservative. The larger raptors (i.e., great horned owl, golden eagle, and bald eagle) were assumed to ingest only small mammals as represented by the jackrabbit data.

Deer mice are omnivorous and ingest both invertebrates and vegetation. The dietary components for the deer mouse were assumed to consist of plants and terrestrial invertebrates in equal proportions. This approach represented a simplifying assumption and was meant to be conservative.

The herbivorous receptors (i.e., mule deer and jackrabbit) ingest only vegetation. Intakes were estimated with the plant data composing 100 percent of the diet.

The kit fox eats both vertebrate and invertebrate prey. Small mammals were represented by jackrabbit data and terrestrial invertebrates were represented by grasshopper and beetle data. These two prey groups were assumed to constitute the kit fox diet in equal proportions. This approach represented a simplifying assumption and was meant to be conservative in that, for the most part, insects had higher contaminant levels than the jackrabbits. The kit fox relies heavily on lagomorphs, 94 percent of them being black-tailed jackrabbits (Fitzgerald et al. 1994). However, if the preferred prey is not available, the kit fox will eat insects because it is opportunistic. Availability of dietary items at any given time will fluctuate seasonally; however, simplifying assumptions must be made to model dietary intake.

In order to evaluate the dietary pathway, the biota data were also used to calibrate a food web model for the terrestrial environment. The model was used to predict food chain transfer and dietary intakes for areas and/or receptors on TEAD for which biota data were unavailable. The model is described in Section 7.2.2.4.

Where analytical data were missing, either because biota were not sampled at a particular location or specific analyses were omitted because of an inadequate amount of sample material, Cterms for calculating intakes (or doses) were developed as follows:

1. Where modeled Cterm values for a particular matrix-analyte combination were available, those values were used to provide Cterms for SWMUs with missing data.

2. For metals where no model had been developed, a ratio of the concentration in biota to the concentration in soil, Cbiota/Csoil, was calculated. If the ratio was less than 0.5, then a value of 1/2 the MDL was used for the Cterm for the missing matrix-analyte combination in order to evaluate the dietary pathway. The ratio is equivalent to the BAF as shown below:

$$BAF = \frac{Ctissue}{Csoil} \qquad \text{(Equation 7-20)}$$

3. Explosives were not analyzed in jackrabbits because munitions undergo extensive metabolic degradation and are not expected to bioaccumulate. Explosives would not be expected to occur in invertebrates for the same reason. In order to statistically account for proper dietary contributions, however, Cterms were created by using a value of 0.0 mg/kg for jackrabbits for RDX and 2,4,6-TNT, and 1/2 the MDL in mg/kg for both RDX and 2,4,6-TNT for grasshoppers and beetles.

4. Herbicides were not analyzed in invertebrates because of a limited amount of sample material. Cterms were created by using 1/2 the MDL for 2,4-D for the grasshoppers and beetles. Cterms for jackrabbits at SWMUs lacking jackrabbit data were created by using 1/2 the MDL for 2,4-D in jackrabbit tissue.

5. PAHs were not analyzed in invertebrates since they are not expected to bioaccumulate. This position is supported by the observation that all of the final PAH HQs for the jackrabbit and plant data, based on actual measured data, were very low, typically less than 0.001. In addition, there was insufficient sample material for PAH analysis in invertebrates. Cterms for beetles and grasshoppers at all locations were created by using 1/2 the MDL for each of the six biota PAHs. There were only two detects of PAH in jackrabbit (one at the RSA and one at SWMU 45). In order to be conservative, the highest detect (pyrene at SWMU 45, 0.00303 mg/kg) was used for the Cterms for jackrabbits for all biota PAHs at SWMUs with no jackrabbit data.

6. For those SWMUs with no pesticides in jackrabbit data, Cterms were represented by the model output for ppDDE and ppDDT. There were no data gaps for pesticides in beetles and grasshoppers. It should be noted, however, that since the invertebrate samples represented SWMU composites, the Cterm for ppDDE in beetles at SWMUs 12/15 was said to be the same at SWMU 12 and also at SWMU 15. This was true for all analytes in grasshoppers and beetles.

7. Because the dioxin/furan compounds are too numerous to model separately and jackrabbits were not collected at every SWMU, a "worst-case" dioxin model for jackrabbits was developed. This "worst-case" model was in addition to models previously developed for total TCDD, total TCDF, OCDD, and total HpCDD (refer to earlier discussion on dioxins/furans in Section 7.2.2.4.2).

Cterm values for jackrabbits and invertebrates, as summarized in Appendix I for analytes at locations where biota were not sampled, were obtained from the bioaccumulation model, or for analytes based upon 1/2 the detection limit, or for analytes described in 1 through 7 above.

7.2.2.5.6 ***Exposure Intakes - Air Inhalation Pathway***. Intakes (or doses) of contaminants due to inhalation of air were estimated by the following equation:

(Equation 7-21)

$$Air\ Intake = \frac{IR \times CA}{BW}$$

where

Air Intake	=	μg/kg bw/day
IR	=	inhalation rate (m^3/day)
CA	=	air concentration ($\mu g/m^3$)
BW	=	body weight (kg)

Air concentrations were obtained from Appendix P of the Final RFI (Rust E&I 1995a) and from the Final Preliminary Baseline Risk Assessment (Rust E&I 1993b).

Calculation of air intake is highly uncertain, in part due to the limited nature of the data available and in part because information regarding the respiratory physiology (i.e., airway size, breathing rate, clearance mechanisms, and alveoli branching pattern) was unavailable in the literature reviewed. The air intakes were calculated as a component of screening, and conservative parameters were used to overcome the lack of analytical data, pharmacokinetic information, and species-specific physiology data. No adjustment was made for absorption (i.e., absorption was conservatively assumed to be 100 percent of the inhaled dose).

The inhalation rate for the kit fox was estimated with an allometric equation for inhalation by mammals (USEPA 1993a). Air intakes were calculated for burrowing mammals only, as burrowing mammals are expected to have the highest contact rate since VOCs in burrow air are likely to be higher than in ambient air. The air inhalation rates for each of the key receptors were as follows:

- Deer mouse: 0.025 m^3/day (USEPA 1993a)
- Kit fox: 2.0 m^3/day (USEPA 1993a)

Body weights for the kit fox range from 1.4 to 2.1 kg, and for the deer mouse, from 0.014 to 0.032 kg (Table 7-1). The lower end of the body weight range was used to allometrically estimate the highest intakes per unit body weight in order to be conservative (USEPA 1993a). Table 7-14 presents the estimated air intakes based on modeled exposure point concentrations in air from Rust E&I (1995a and 1993b).

7.2.3 Stress Response Analysis

Ecological field investigations as outlined in Sections 3.0 to 3.3 were conducted by Rust E&I during the summer and fall of 1994 at the TEAD facility. The qualitative survey results and the quantitative ecological data collected during these field investigations, along with additional ecological information derived from literature, were used to identify potential adverse effects at TEAD. The occurrence and distribution, as well as the relative abundance and dominance of biotic species, were measured at the RSA and at locations on TEAD. This information allowed the ESAs and the RSA to be compared.

Table 7-14. Air Intakes Based on Modeled Air Exposure Point Concentrations

SWMU[a]	Analyte	Concentration (µg/m3 [b])	Intakes (µg/kg-day [c]) Deer Mouse	Kit Fox
12/15	Xylene	5.18E-03	8.75E-03	7.40E-03
	Trichlorofluoromethane	3.90E-02	6.59E-02	5.57E-02
	Trichloroethylene	2.30E-02	3.89E-02	3.29E-02
	Ethylbenzene	3.07E-03	5.19E-03	4.39E-03
	Acrylonitrile	1.60E-02	2.70E-02	2.29E-02
	Chlorobenzene	1.60E-04	2.70E-04	2.29E-04
	Dichloroethylene	2.60E-03	4.39E-03	3.71E-03
	MIBK (methyl isobutyl ketone)	1.20E-03	2.03E-03	1.71E-03
	Tetrachloroethylene	4.90E-04	8.28E-04	7.00E-04
	Toluene	1.10E-03	1.86E-03	1.57E-03
29/30	Benzo(a) anthracene	5.10E-08	8.61E-08	7.29E-08
	Benzo(a) pyrene	5.69E-06	9.61E-06	8.13E-06
	Benzo(k) fluoranthene	7.33E-11	1.24E-10	1.05E-10
	Carbon Tetrachloride	7.24E-03	1.22E-02	1.03E-02
	Chrysene	1.20E-09	2.03E-09	1.71E-09
	Ethylbenzene	2.33E-04	3.94E-04	3.33E-04
	Fluoranthene	2.38E-05	4.02E-05	3.40E-05
	Phenanthrene	1.26E-04	2.13E-04	1.80E-04
	Pyrene	2.55E-08	4.31E-08	3.64E-08
	Tetrachloroethylene	7.24E-03	1.22E-02	1.03E-02
	Toluene	1.00E-02	1.69E-02	1.43E-02
	1,1,1-Trichloroethane	2.08E-02	3.51E-02	2.97E-02
1	2,4-Dinitrotoluene	3.55E-05	6.00E-05	5.07E-05
	2,6-Dinitrotoluene	5.05E-04	8.53E-04	7.21E-04
	HMX	1.44E-12	2.43E-12	2.06E-12
	2,4,6-Trinitrobenzene	1.84E-05	3.11E-05	2.63E-05
10/11	2,4-Dinitrotoluene	1.18E-04	1.99E-04	1.69E-04
	1,3,5-Trinitrobenzene	5.79E-03	9.78E-03	8.27E-03
	HMX	2.43E-12	4.10E-12	3.47E-12
	2,4,6-Trinitrobenzene	3.19E-03	5.39E-03	4.56E-03
	Toluene	2.63E-03	4.44E-03	3.75E-03

[a]Solid Waste Management Unit.

[b]Micrograms per cubic meter.

[c]Micrograms per kilogram body weight per day.

Note-. Kit fox - 1.4 to 2.1 kg (used most conservative).

Note-. Concentrations from P-1, VOC modeling, Final RFI, Vol. 5, April 1995. 2 ft. height; summed surface and subsurface; also included 1993 report (Table 3-5, 3-7; industrial (was higher than residential for SWMU 29)).

The population data presented in this section are not conclusive because they represent only a subset of sampling within a single year. Data collected over multiple years could provide different results. However, the data are sufficient to indicate general trends in the populations measured.

7.2.3.1 *TEAD Habitat Descriptions*

This section describes the habitats at TEAD, which as a region is classified as a cold semi-desert dominated by sagebrush, saltbush, and grass species. Habitat descriptions at TEAD differ from range-type descriptions in that range descriptions incorporate anthropomorphic impact on the indigenous vegetation. A habitat is generally defined by the predominant vegetation growing at an identified location. The habitats at TEAD have been disturbed by various human activities over the years. Industrial activities—including maintenance, renovation, and storage of combat vehicles and ammunition—and military activities—including munitions testing and disposal—have occurred. Cattle grazing over large areas of TEAD is a historical major land use that is still practiced.

The following major habitat types have been noted in previous RI and RFI reports at TEAD (Rust E&I 1994a, 1995a, and 1997; Montgomery Watson 1993 and 1996; SAIC 1996a and 1996b). Some of the habitats reflect a disturbance of the native vegetation by Army activities and grazing. The major terrestrial habitats are:

- Sagebrush-Juniper
- Disturbed Grassland
- Disturbed Sagebrush
- Grassland-Juniper
- Sagebrush
- Greasewood
- Urban (maintenance/administrative areas)

Figure 2-19 shows the distribution of the terrestrial habitats across TEAD. In addition, manmade wetlands habitats were identified as shown in Figure 1-6. The wetlands habitat type only occurred at SWMU 14, Sewage Lagoons. Key species in the wetland habitat at SWMU 14 are cattails, grasses, cottonwood, and willow. Algae grow on the sediments of the Sewage Lagoons.

The ESAs at the TEAD facility and the RSA are comprised of combinations of the previously listed habitat types. The distribution of habitat types at each study area where data were collected are shown in Table 7-15. This table also identifies major habitats within the small mammal trapping grids at each location. Wetland habitat predominated at the SWMU 14 Sewage Lagoons. At other locations, habitat typically included a mix of sagebrush, grasslands, and juniper. At most locations, disturbance was also a significant feature.

Table 7-15. Habitat Types at the ESAs and the RSA

Location	Habitats	% Habitat Types	% Habitat Type at Trapping Grid
ESA[a]-1 (SWMUs[b] 42/45)	Urban	25	0
	Sagebrush	65	95
	Disturbed Sagebrush	10	5
ESA-2 (SWMUs 10/11)	Sagebrush-Juniper	15	0
	Disturbed Grassland	30	95
	Disturbed Sagebrush	25	0
	Grassland-Juniper	15	5
	Sagebrush	15	0
ESA-2 (SWMUs 12/15)	Disturbed Grassland	40	100
	Disturbed Sagebrush	35	0
	Sagebrush	25	0
ESA-2 (SWMUs 1b/1c)	Sagebrush-Juniper	20	0
	Disturbed Grassland	25	95
	Disturbed Sagebrush	25	5
	Greasewood	20	0
	Sagebrush	10	0
ESA-2 (SWMUs 21/37)	Sagebrush-Juniper	10	0
	Disturbed Sagebrush	50	0
	Sagebrush	38	100
	Wetlands	2	0
ESA-3 (SWMU 14)	Wetlands/Transition	100	NA[d]
RSA[c]	Sagebrush-Juniper	25	0
	Disturbed Sagebrush	10	0
	Disturbed Grassland	20	0
	Sagebrush	45	100

[a]Ecological study area.
[b]Solid waste management unit.
[c]Reference study area.
[d]Not applicable. Small mammal trapping was not conducted at SWMU 14 Sewage Lagoons.

7.2.3.2 *Vegetation Field Surveys*

As described in Section 6.2, vegetation surveys were conducted at TEAD and the RSA in order to identify and quantify populations of key species. Plant species occurrence data were collected at locations within SWMUs 1b/1c, 10/11, 12/15, 21/37, 42, and 45, and the RSA during September 1994. Only the vegetation data from transects located in SWMUs where small mammal data were collected were quantitatively evaluated. Vegetation data obtained earlier in the summer for SWMUs 1b, 1c, 2 through 10, 12, 13, 14, 17, 19 through 33, 35, 36, 37, 40, 41, 42, and 45 were used for purposes of qualitative site characterization, but were not used in the quantitative risk assessment.

For each of the SWMUs located in ESA-1 and ESA-2, and the RSA, the vegetation abundance data from each of the five transects were combined to obtain an average abundance. Species with an average value below 1 percent at any SWMU or the RSA were excluded from further analysis. The data were converted to percent in order to determine dominant species and habitat at each study area. These data are graphically presented in Figures 7-1 through 7-7.

Litter is the dominant feature at the RSA (Figure 7-1). Cheatgrass (*Bromus tectorum*) and bare ground were the next two dominant features measured at the RSA, followed by sagebrush (*Artemisia tridentata*). The RSA is a mature, relatively undisturbed sagebrush/sagebrush-juniper community located approximately 5 miles south of TEAD at the southern base of South Mountain just east of the Stansbury Mountains. The area slopes gently eastward toward the valley floor. The elevation of the RSA is the same as the northwest portion of TEAD but is approximately 500 feet higher than the southeast portion of TEAD. The dominant soil type is Upland loam (Doyce loam) on a 2 to 8 percent slope very similar to the Doyce loam present at TEAD. Large portions of the RSA are under BLM jurisdiction. The RSA also contains Rush Lake, which is surrounded by private, agricultural property.

SWMUs 1b/1c (OB/OD Burn Pads/Trash Burn Pits) are disturbed areas on TEAD, where *B. tectorum*, bare ground, and litter are the dominant habitat features (Figure 7-2). Other grasses and forbs occur in lower abundance. The area was used for munitions disposal (open burning and open detonation) and is best described as disturbed sagebrush/sagebrush habitat.

B. tectorum dominates the habitat at SWMUs 10/11 (TNT Washout Facility/Laundry Effluent Ponds) (Figure 7-3). Other grasses and forbs also occur. At this area, gravel roads and litter predominate over bare ground. Cattle grazing is extensive in this area. The habitat is best described as disturbed grassland/grassland-juniper.

SWMUs 12/15, Pesticide Disposal/Sanitary Landfill (Figure 7-4), contain a greater variety of vegetative species than the other communities described above. Rock, however, is a dominant habitat feature due to the historical use of the area as a landfill. *Melilotus alba* (white sweetclover), *B. tectorum*, litter, and bare ground are other predominant features. Other grasses and forbs occur primarily in previously filled and graded portions of the landfill. SWMU 12 is the Pesticide Disposal Area, which is within the general area of SWMU 15, the Sanitary Landfill. The landfill has been closed for the disposal of domestic wastes since the

spring of 1994 but has continued to receive construction rubble. The habitat is best described as a disturbed grassland/sagebrush community.

SWMU 45, the Stormwater Discharge area, consists of a small, unlined ponding area within a drainage that receives runoff form the Administration Area. The soil within the ponding area is saturated with water for much of the year. Litter, *B. tectorum*, asphalt, and *Agropyron cristatum* (crested wheatgrass) dominate SWMU 45, which is described as sagebrush/disturbed grassland, with some riparian species occurring near the pond. Other grasses and forbs occur within the drainage area, although these species were less frequently recorded (Figure 7-5).

At SWMU 42, the Bomb Washout Building, which is described as a sagebrush/disturbed grassland habitat, *Aristida purpurea* (purple three-awn) and *B. tectorum*, asphalt, litter, and were the dominant habitat features (Figure 7-6). Other lesser amounts of grasses and forbs occur throughout the area.

At SWMUs 21/37, bare ground, litter, and *B. tectorum* comprised nearly 72 percent of the vegetation measurements on the five transects (Figure 7-7). Other forbs and grasses also occurred. The habitat is predominantly sagebrush/sagebrush-juniper.

Over 42 species of plants or habitat features (i.e., litter, bare ground, rock) were documented during the SWERA field efforts. The vegetation types were coded in order to facilitate statistical analysis. Species were combined by genus when multiple species within a genus occurred (e.g., *Poa bulbosa* and *Poa fendleriana* were combined as *Poa spp*.). Table 7-16 presents the species for each location combined into groups of grasses, forbs, and shrubs, showing their relative abundance in percent. A guide to the scientific and common names for vegetation species is presented in Appendix A.

Utilizing these detailed survey data, community similarity indices were calculated in order to define differences in community structure between locations and to substantiate the qualitative survey performed to select the RSA (Section 2.2.4.2). The Jaccard coefficient of community (Brower and Zar 1977) (CC_j) quantifies community similarity by comparing the species in one community to those in another:

(Equation 7-22)

$$CC_j = \frac{c}{(s_1 + s_2 - c)}$$

where

s_1 = number of species in community 1
s_2 = number of species in community 2
c = number of species common to both communities

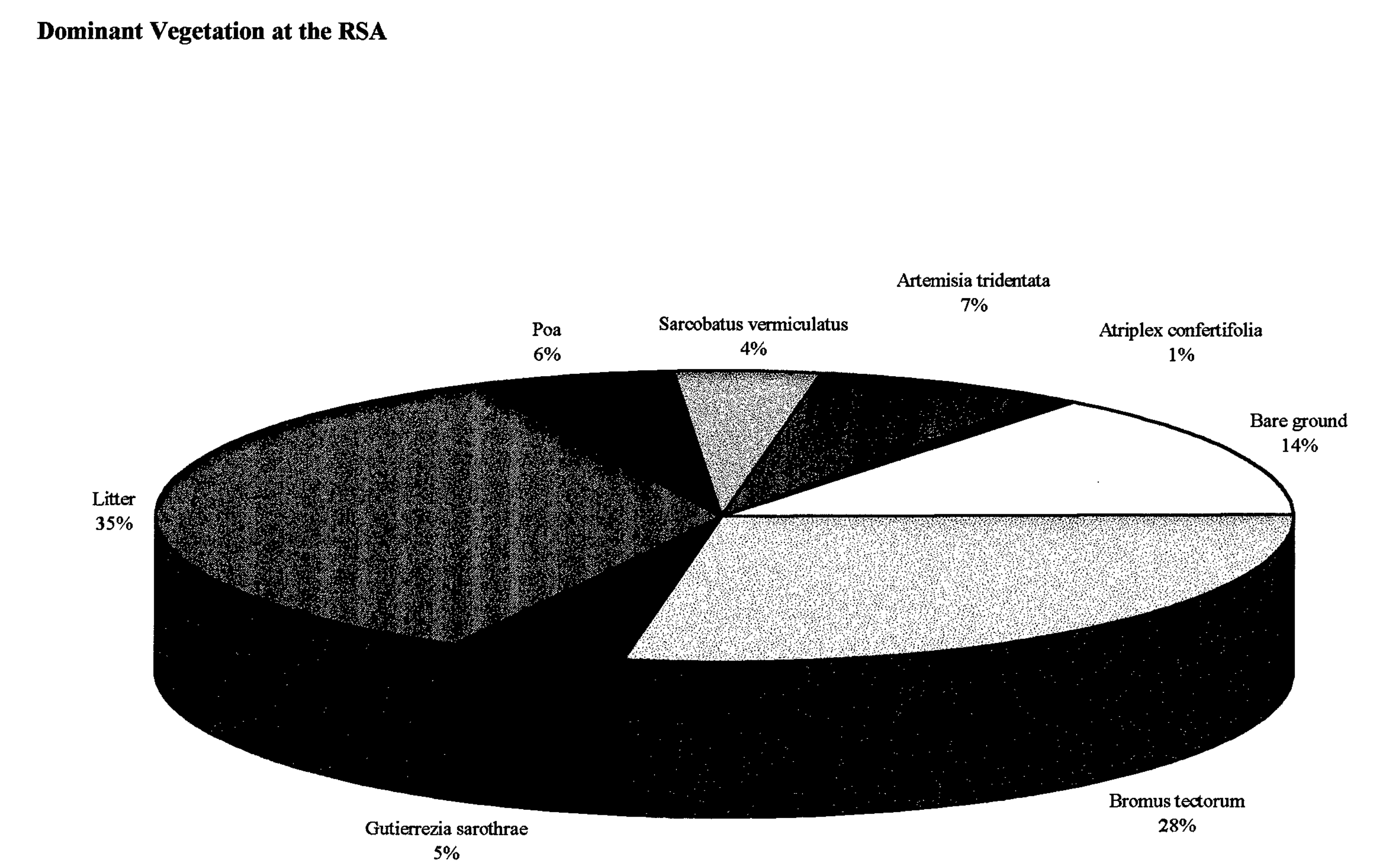


Figure 7-1. Dominant Vegetation at the RSA

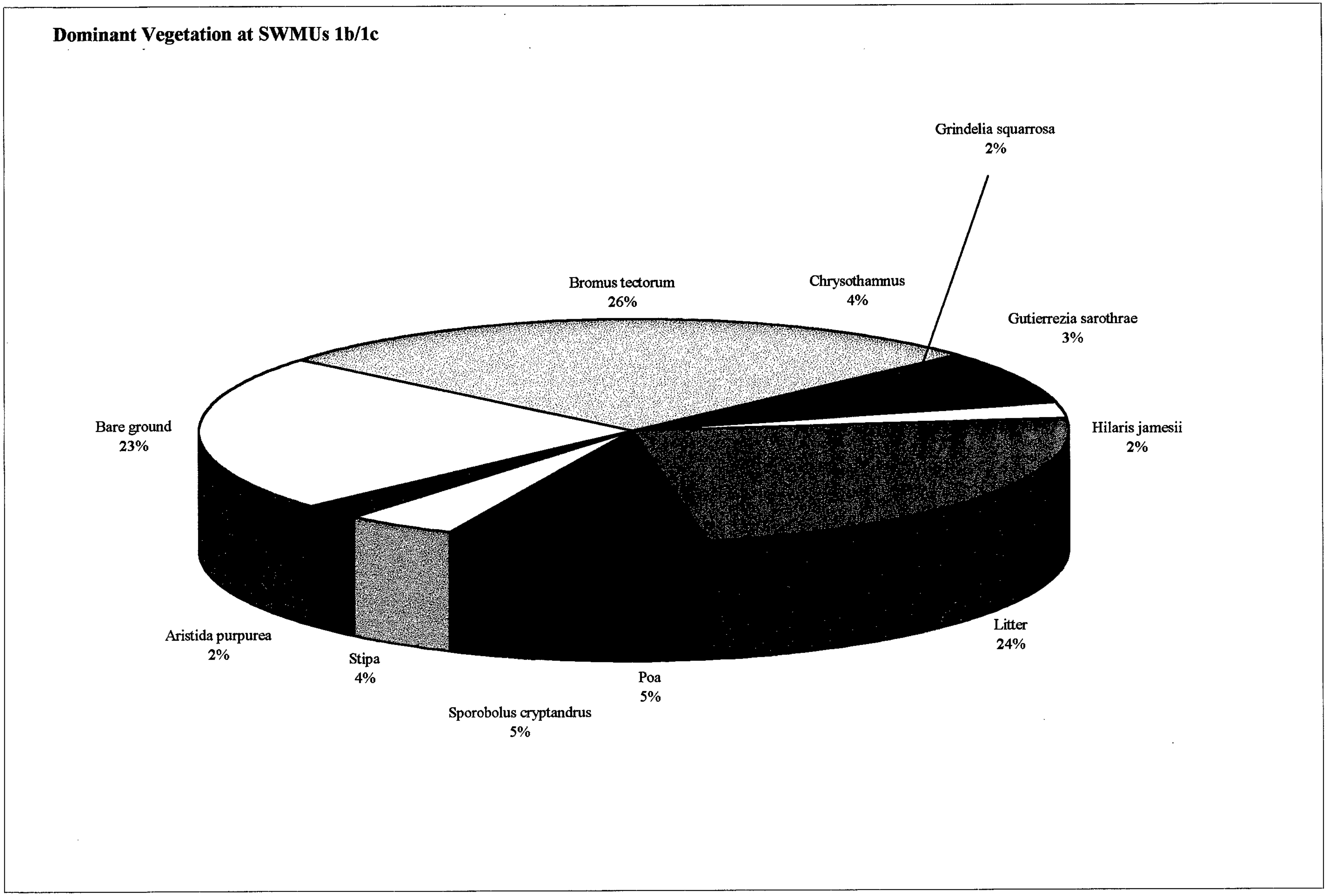


Figure 7-2. Dominant Vegetation at SWMUs 1b/1c (Open Burn/Open Detonation - Burn Pads/Trash Burn Pits)

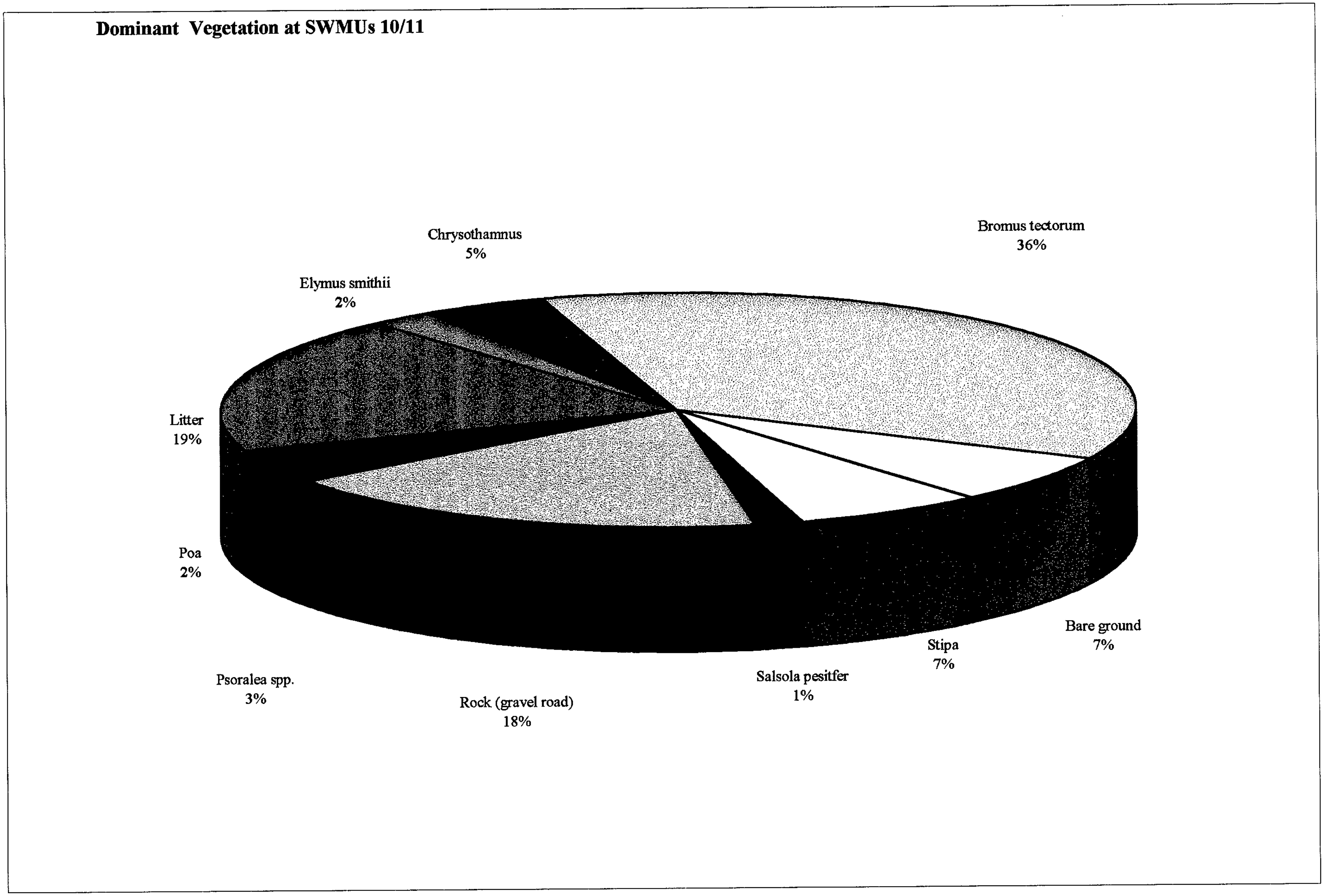


Figure 7-3. Dominant Vegetation at SWMUs 10/11 (TNT Washout Facility/Laundry Effluent Ponds)

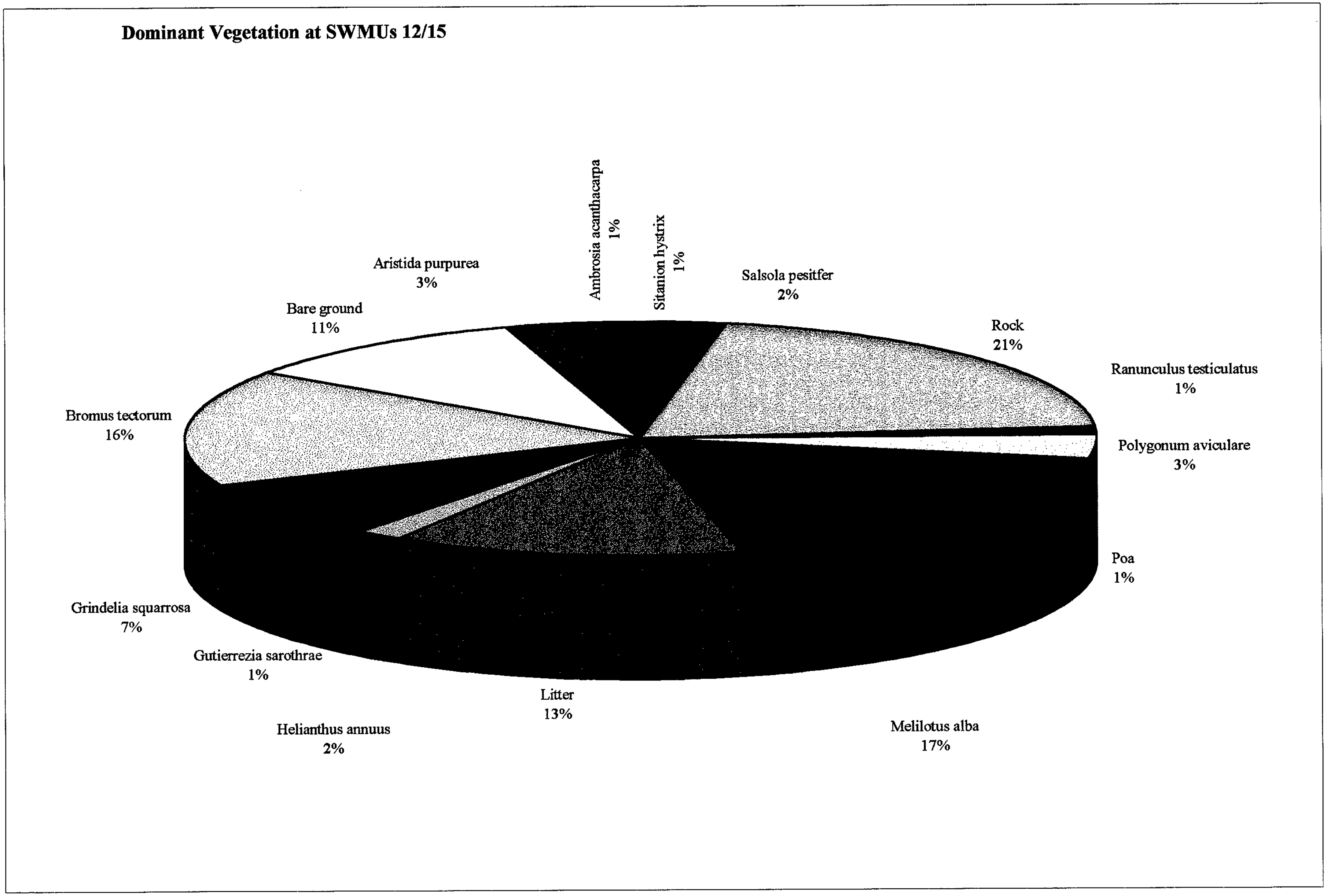


Figure 7-4. Dominant Vegetation at SWMUs 12/15 (Pesticide Disposal/Sanitary Landfill)

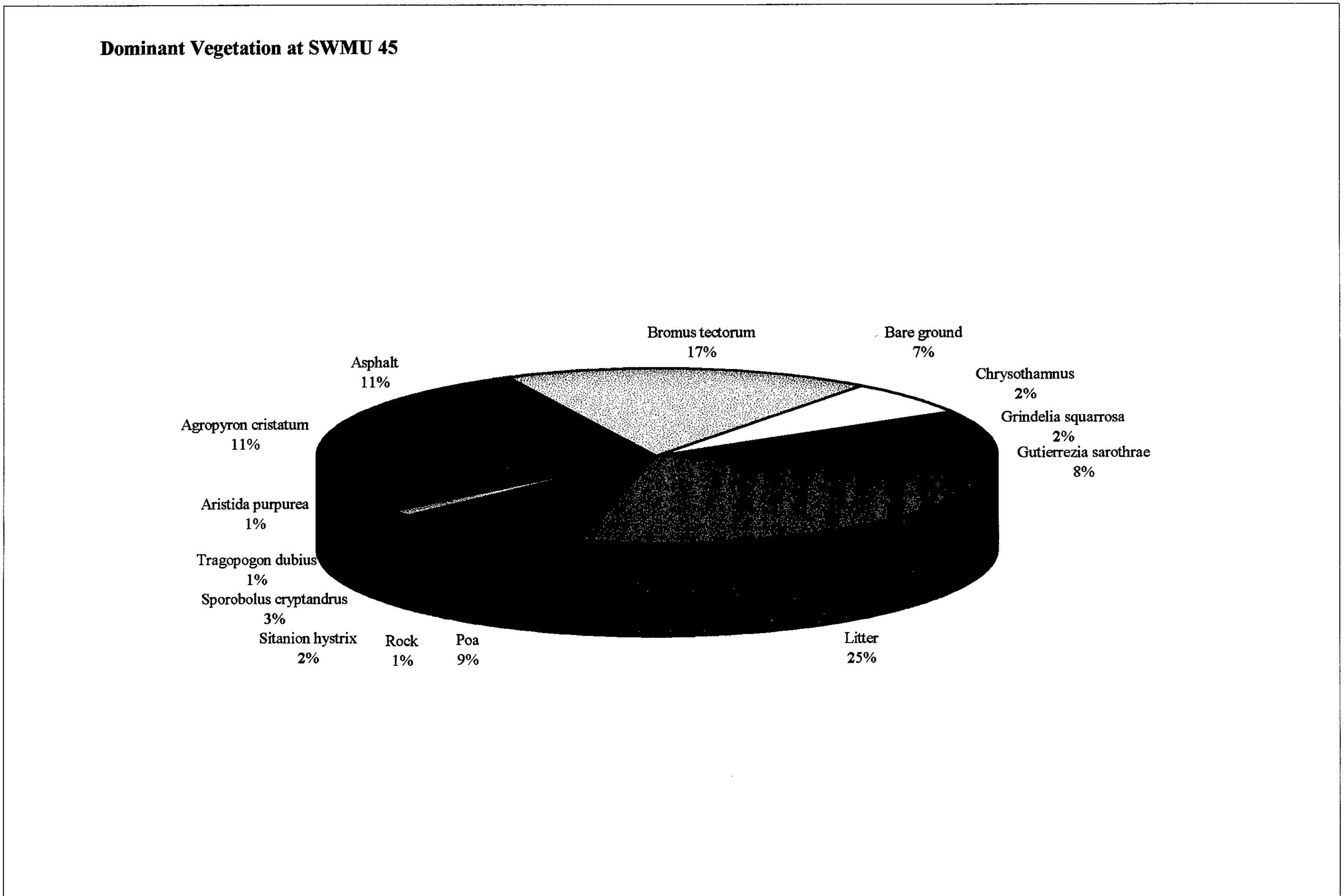


Figure 7-5. Dominant Vegetation at SWMU 45 (Stormwater Discharge)

Dominant Vegetation at SWMU 42

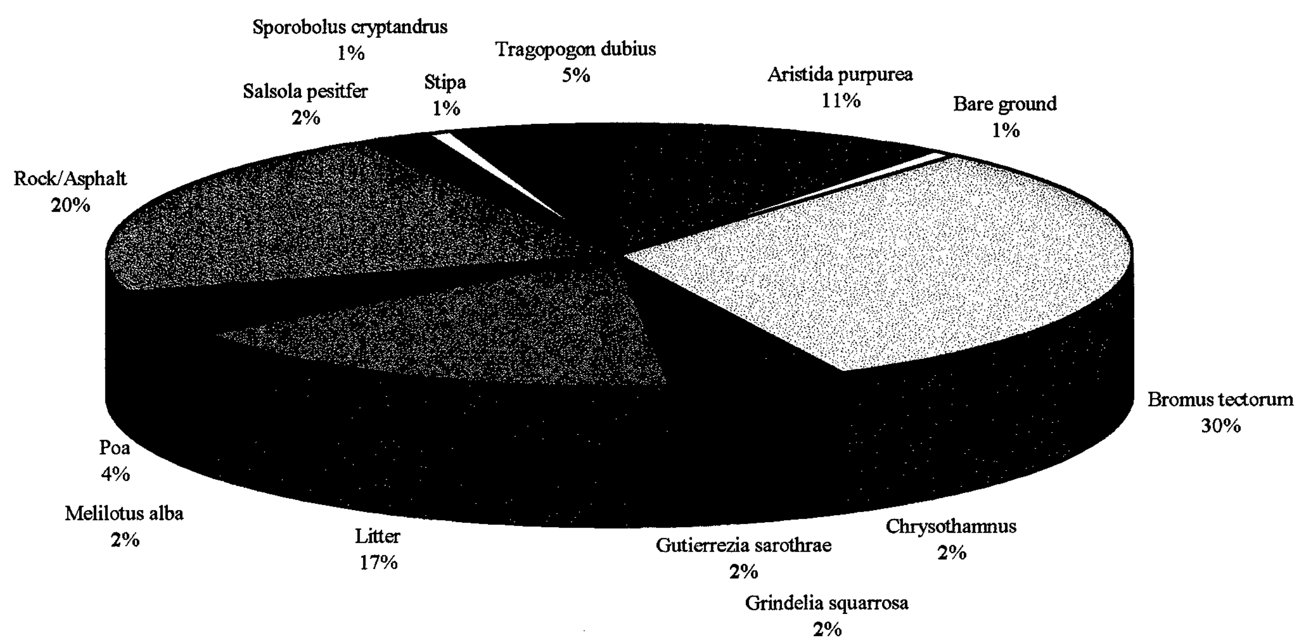


Figure 7-6. Dominant Vegetation at SWMU 42 (Bomb Washout Building)

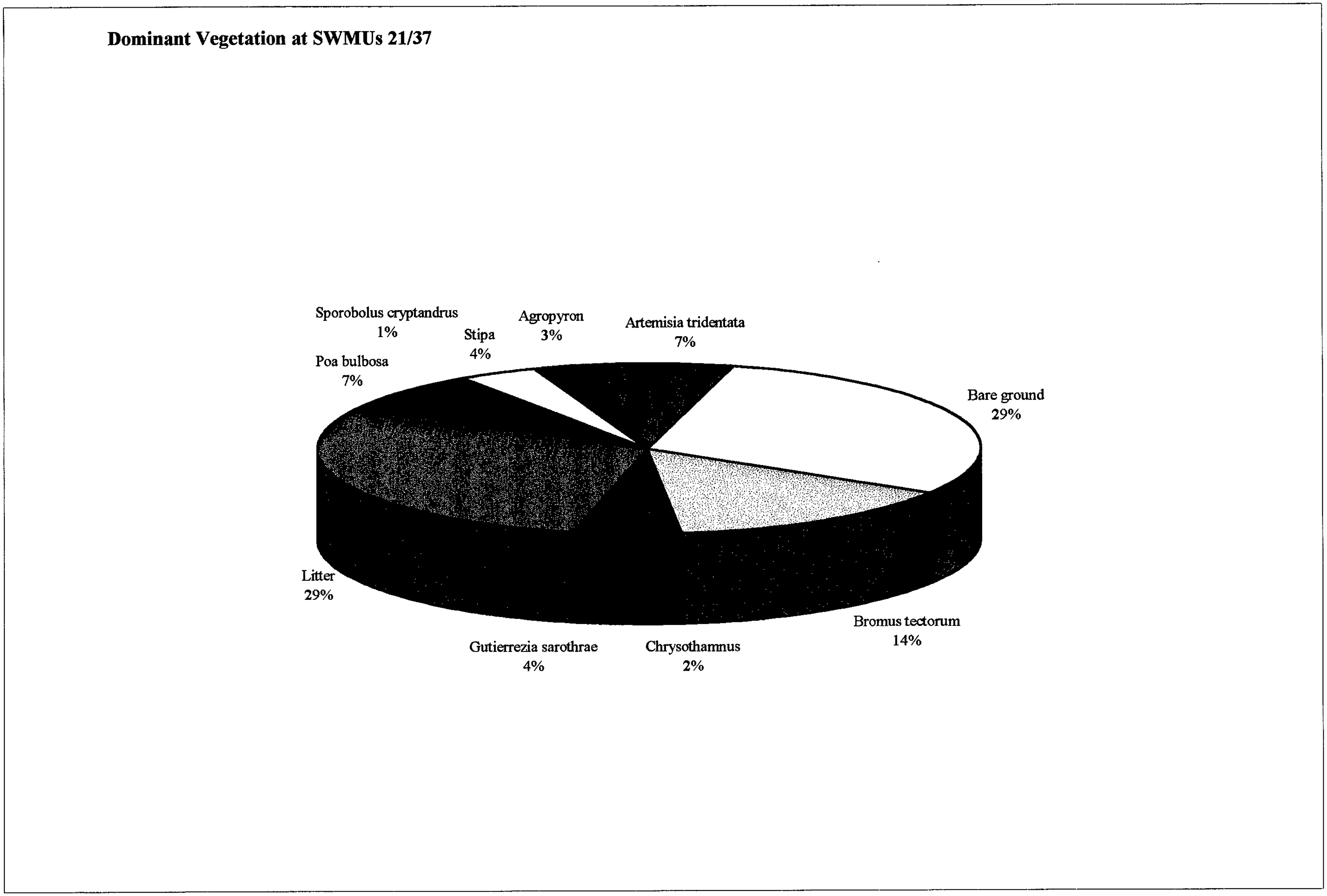


Figure 7-7. Dominant Vegetation at SWMUs 21/37 (AED Deactivation Furnace/Contaminated Waste Processor)

Table 7-16. Dominant Vegetation by Cover Type

	RSA[a]	SWMU[b] 1b/1c	SWMU 10/11	SWMU 12/15	SWMU 45	SWMU 42	SWMU 21/37
Grasses							
Poa spp.	.06	.05	.02	.01	.09	.04	.07
Bromus tectorum	.28	.26	.36	.16	.17	.30	.14
Stipa spp.		.04	.07			.01	.04
Aristida purpurea		.02		.03	.01	.11	
Hilaris jamesii		.02					
Elymus smithii			.02				
Agropyron cristatum					.11		.03
Sporobolus cryptandrus		.05			.03	.01	.01
Total Grasses	**.34**	**.44**	**.47**	**.20**	**.41**	**.47**	**0.29**
Shrubs							
Artemisia tridentata	.07						.07
Sarcobatus vermiculatus	.04						
Atriplex confertifolia	.01						
Chrysothamnus spp.		.04	.05		.02	.02	.02
Gutierrezia sarothrae	.05	.03		.01	.08	.02	.04
Total Shrubs	**.17**	**.07**	**.05**	**.01**	**.10**	**.04**	**.13**
Forbs							
Grindelia squarrosa		.02		.07	.02	.02	
Salsola pesitfer			.01	.02		.02	
Ambrosia acanthacarpa				.01			
Ranunculus testiculatus				.01			
Melilotus alba				.17		.02	
Helianthus annuus				.02			
Tragopogon dubius ssp. major					.01	.05	
Psoralea spp.			.03				
Polygonum aviculare				.03			
Sitanion hystrix				.01	.02		

Table 7-16. Dominant Vegetation by Cover Type (continued)

	RSA[a]	SWMU[b] 1b/1c	SWMU 10/11	SWMU 12/15	SWMU 45	SWMU 42	SWMU 21/37
Total Forbs	**0.00**	**.02**	**.04**	**.34**	**.05**	**.11**	**0.00**
Other							
Litter	.35	.24	.19	.13	.25	.17	.29
Bare Ground	.14	.23	.07	.11	.07	.01	.29
Rock			.18	.21	.01	.20	
Road					.11		
Total Other	**.49**	**.47**	**.44**	**.45**	**.44**	**.38**	**.58**

Note.—Values would be expressed as a percent if multiplied by 100.
[a]Reference study area.
[b]Solid waste management unit.

Another method for examining community similarity is the Sorensen Coefficient (CC_s):

(Equation 7-23)

$$CC_s = \frac{2c}{s_1 + s_2}$$

The values of both coefficients range from 0, where no similarity exists between the communities, to 1, where the communities have many species in common. Habitat features such as bare ground, rock, and litter were utilized in the evaluation of community similarity in addition to the plant species.

Table 7-17 presents the coefficients of similarity for the SWMUs to the RSA using the same terms expressed in the above equations. As shown, vegetation communities within SWMUs at TEAD are moderately similar to the community of the RSA, which is relatively undisturbed. SWMUs 21/37 and 1b/1c bear the greatest resemblance to the RSA in terms of species assemblage or habitat similarity. Although every attempt was made to reduce all variables except chemical disturbance between the RSA and TEAD, selection of the RSA was constrained by urbanization in the TEAD vicinity and by geological barriers in the form of the Stansbury Mountains to the west, South Mountain to the south, and the Oquirrh Mountains to the east. The RSA is also generally less disturbed than TEAD. The results of the similarity analyses indicate that the RSA was a reasonable selection, which supports the risk characterization process.

Table 7-17. Coefficients of Similarity for the SWMUs for Vegetation Communities Compared to the RSA

Location	s_1[a]	s_2[b]	c[c]	CC_j[d]	CC_s[e]
RSA[f]	8				
SWMUs[g] 1b/1c		11	5	0.36	0.53
SWMUs 10/11		10	4	0.29	0.44
SWMUs 12/15		15	5	0.28	0.44
SWMU 45		14	5	0.29	0.45
SWMU 42		14	5	0.29	0.45
SWMUs 21/37		10	6	0.50	0.67

[a]Number of species in community 1.
[b]Number of species in community 2.
[c]Number of species in common to both communities.
[d]Jaccard coefficient.
[e]Sorensen coefficient.
[f]Reference study area.
[g]Solid waste management unit.

7.2.3.3 *Small Mammal Field Surveys*

The small mammal survey data were examined for relative abundance, density, and diversity. Live traps were set in 60-meter-by-60-meter grids (approximately 0.9 acre) and left open for 3 nights. The traps were checked daily. There were a total of 75 trap nights at each trapping location. Mammals trapped were identified by species, weight, sex, reproductive stage, and age to the extent possible, and were subsequently marked and released. The data are described below.

7.2.3.3.1 ***Abundance and Density of Small Mammal Species.*** There were eight small mammal species trapped at the RSA and TEAD. The deer mouse *(Peromyscus maniculatus)* was the species most frequently collected (Figure 7-8). This species was trapped at every site where trapping occurred. Chipmunks *(Eutamias minimus)*, sagebrush vole *(Lagurus curtatus)*, and microtine voles (*Microtus montanus* and *Microtus longicaudus*) were only collected at the RSA. The Kangaroo rat (*Dipodomys ordii)* and the harvest mouse (*Reithrodontomys spp.*) were only collected from SWMUs on TEAD, and not from the RSA.

Relative abundance is the number of each species collected divided by the total of all species collected at each location. Figure 7-8 shows the relative abundance of small mammals by SWMU. Deer mouse relative abundance ranged from 57 to 72 percent between the SWMUs; the RSA had the lowest relative abundance of deer mice. This is not surprising since deer mice are colonizers of disturbed habitat (Fitzgerald et al. 1994).

Small mammal density (N) was calculated according to the Lincoln-Peterson method presented in Brower and Zar (1977), which is:

(Equation 7-24)

$$N=\frac{(M)(n)}{R}$$

where

M = number marked during first period
n = number caught the second period
R = number of recaptures in second period

The following assumptions must be met for the estimate to be accurate:

- Individuals have an equally likely chance of capture.
- No change in ratio of marked and unmarked animals occurred between sampling dates.
- Marked individuals are homogeneously distributed in the population with respect to the unmarked animals.

The first assumption is likely to be met except for random behavioral variation, such that some animals could become either easier or more difficult to catch due to their initial trapping experience. The sampling days were consecutive. Because the sampling periods were so close together, except for random deaths or predation, the second assumption should be met. The sampling size of marked individuals was small, however, which makes all estimates more uncertain.

Density of small mammals (number per 3,600 m^2 trapping grid), estimated from the parameters M, n, and R, is reported in Table 7-18. In general, the first day of trapping was used to represent M, and the second day to obtain n and R. However, in the event that there were no recaptures the second day, the third day was used to provide the necessary data.

Statistical Analysis of Small Mammal Density Data

Several statistical tests were used to analyze the data in order to determine if the differences between the populations on TEAD were statistically and significantly different (i.e., more different than could be attributed to chance) than those from the RSA. The Kruskal-Wallis test (KW Test) is a nonparametric test designed to analyze k data sets (Gilbert 1987). Therefore, the data need not be from normal or symmetric distributions; however, the k distributions are assumed to be identical in shape. The KW test analyzes whether or not the populations from which the k independent data sets have been collected have the same mean.

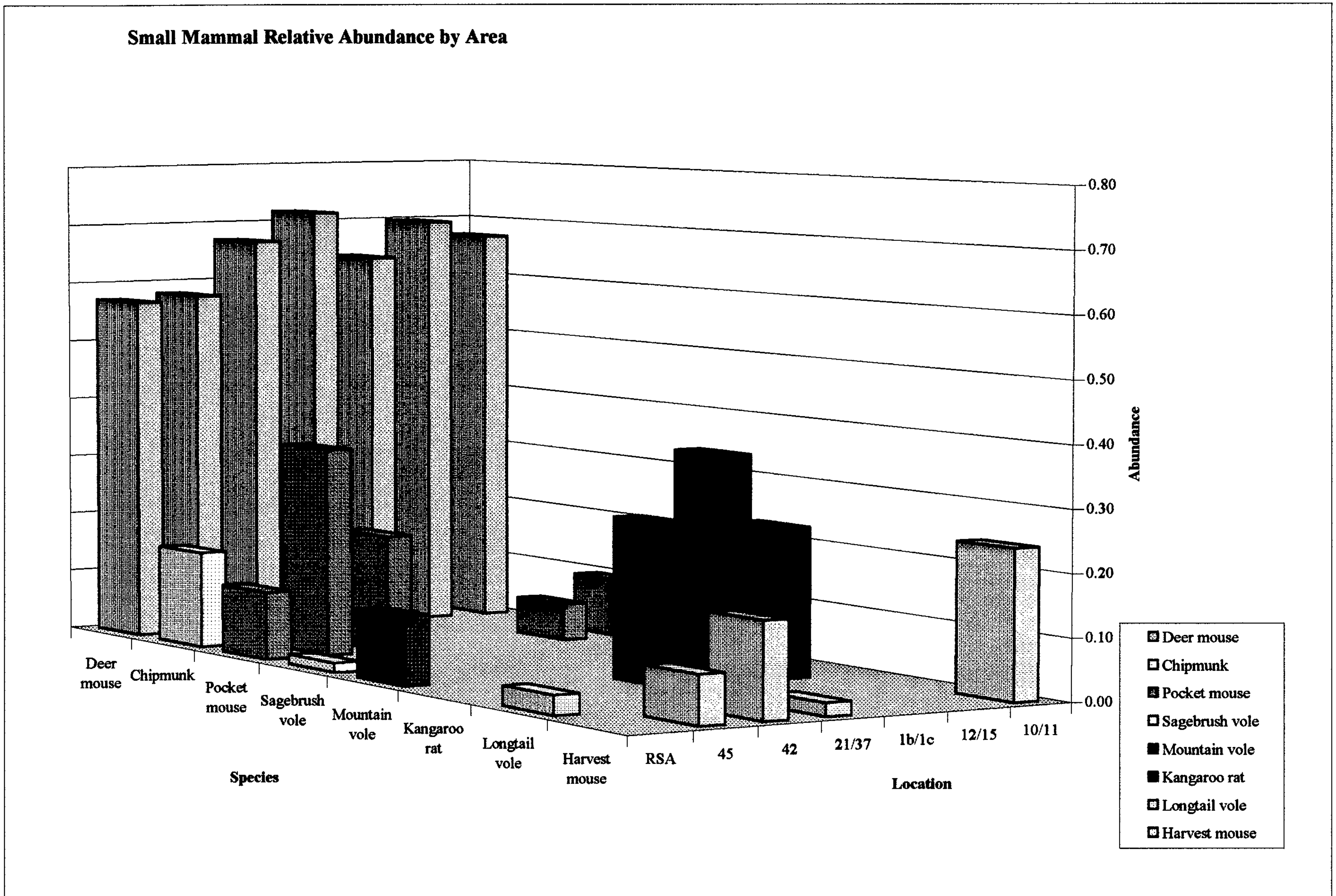


Figure 7-8. Small Mammal Relative Abundance by Location

Table 7-18. Small Mammal Abundance, Density, Trapping Success, and Diversity by Location

Location	Species	Relative Abundance (%)	Density (per 3,600 m²)	Diversity	Trapping Success
RSA[a]	Deer mouse	57	36.4	0.55	0.84
	Chipmunk	16	8		
	Pocket mouse	11	6		
	Sagebrush vole	2	NA[b]		
	Mountain vole	11	6		
	Longtailed vole	3	NA		
SWMUs[c] 1b/1c	Deer mouse	64	9.6	0.285	0.43
	Kangaroo rat	36	13.5		
SWMUs 10/11	Deer mouse	67	13.5	0.363	0.28
	Pocket mouse	10	NA		
	Harvest mouse	24	3		
SWMUs 12/15	Deer mouse	70	13.5	0.332	0.44
	Pocket mouse	6	NA		
	Kangaroo rat	24	12		
SWMUs 21/37	Deer mouse	72	25	0.292	0.63
	Kangaroo rat	26	12		
	Harvest mouse	2	NA		
SWMU 42	Deer mouse	67	15	0.376	0.35
	Pocket mouse	19	6		
	Harvest mouse	15	4		
SWMU 45	Deer mouse	58	9	0.384	0.51
	Pocket mouse	34	10		
	Harvest mouse	8	NA		

[a]Reference study area.
[b]Not applicable or data not available.
[c]Solid waste management unit.

For example, the null hypothesis for deer mouse density was:

H_0: The populations at TEAD and the RSA have the same mean density.
H_A: At least one of the populations has a mean that is different from at least one other population.

Average small mammal density for all species combined was not observed to differ significantly by location (Figure 7-9). The 95 percent confidence limits overlapped for every site. A KW test was performed on the data and was found to support the parametric results of no significant difference. Therefore, density is similar between TEAD ESAs and the RSA.

Because the deer mouse was the only species collected at all locations, this species was selected for further statistical analysis to determine if populations differed significantly between the RSA and TEAD ESAs. Deer mouse density was analyzed by multiple linear regression.

A multiple linear regression is similar to a simple linear regression except that multiple independent variables (x_i) are used to predict the behavior of the dependent variable (y). The general formula for the multiple linear regression is:

$$y = b_0 + b_1 x_1 \ldots b_n x_n \qquad \text{(Equation 7-25)}$$

The letters b_1 and b_n denote the coefficients, and b_o the y-intercept.

The multiple linear regression equation resulting from the analysis summarizes the relationship between the various independent (**x**) variables with the dependent variable (**y**). When there is a strong linear correlation between the variables **x** and **y**, the data cluster tightly around the line. When the variables are not associated strongly, the data appear widely scattered.

The data were first analyzed by running a series of simple linear regressions with each of the variables litter, rock, road, *Bromus tectorum, Poa sp.*, and bare ground. The variables with the strongest correlation coefficient (r) were then combined into a multiple linear regression in a stepwise manner, utilizing the statistical software Statgraphics Plus (Manuguistics).

The best regression for deer mouse density was calculated using three variables—rock, litter, and road—which combined to make a strong regression as follows:

$$\text{Density} = 0.908\ (\text{Road}) + 2.08\ (\text{Litter}) - 15.40\ (\text{Rock}) - 37.6 \qquad \text{(Equation 7-26)}$$

The regression had an r^2 (regression factor) of 0.89 and a significance of 94 percent (alpha equal to 0.06) for the model. This indicates that disturbance and habitat variables could account for nearly all of the variability in deer mouse density between sites (i.e., deer mouse density can be predicted if the fraction of road, litter, and rock is known for any given area). Figure 7-10 presents the observed data plotted against the values predicted by the linear regression.

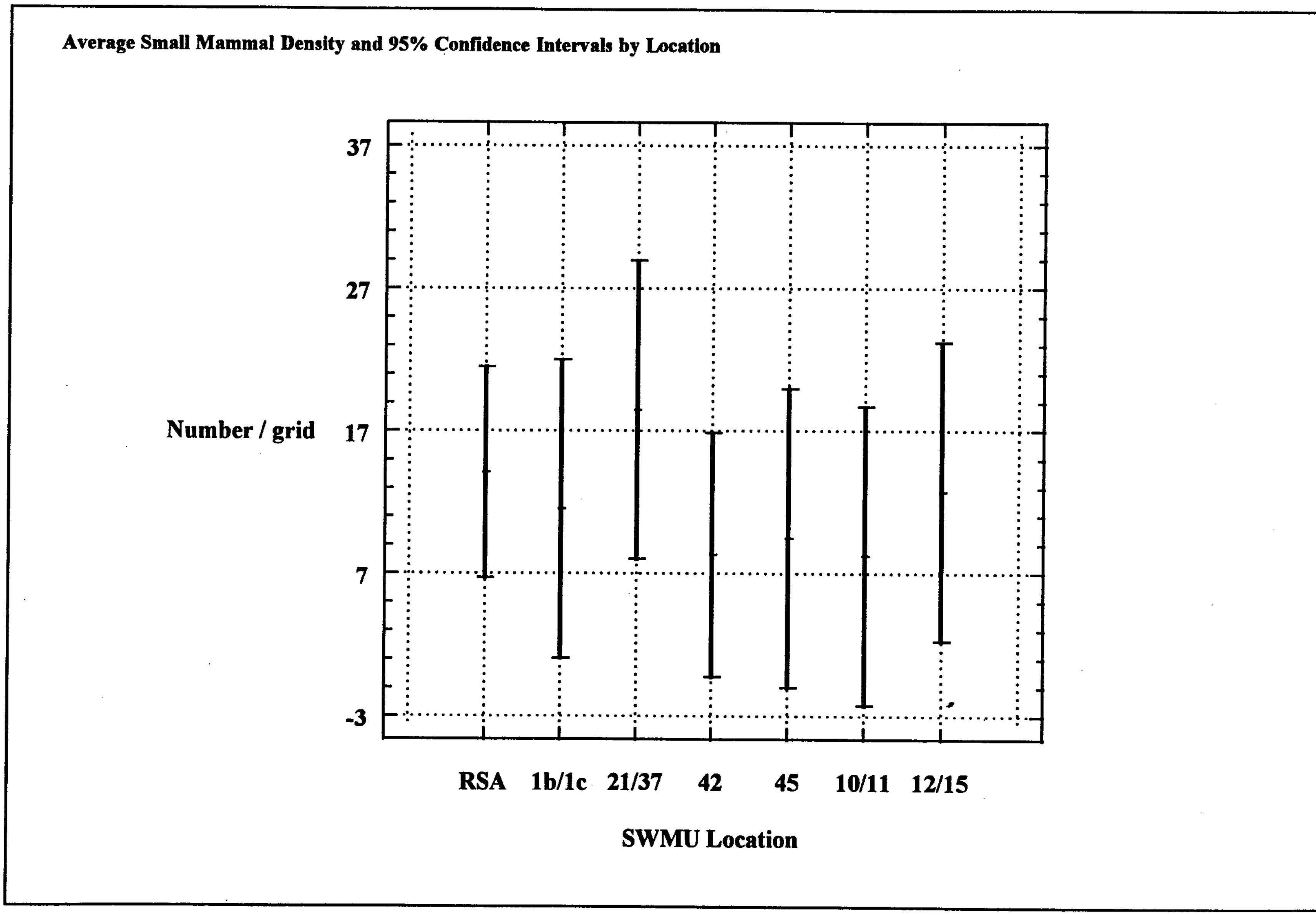


Figure 7-9. Average Small Mammal Density and 95% Confidence Intervals by Location

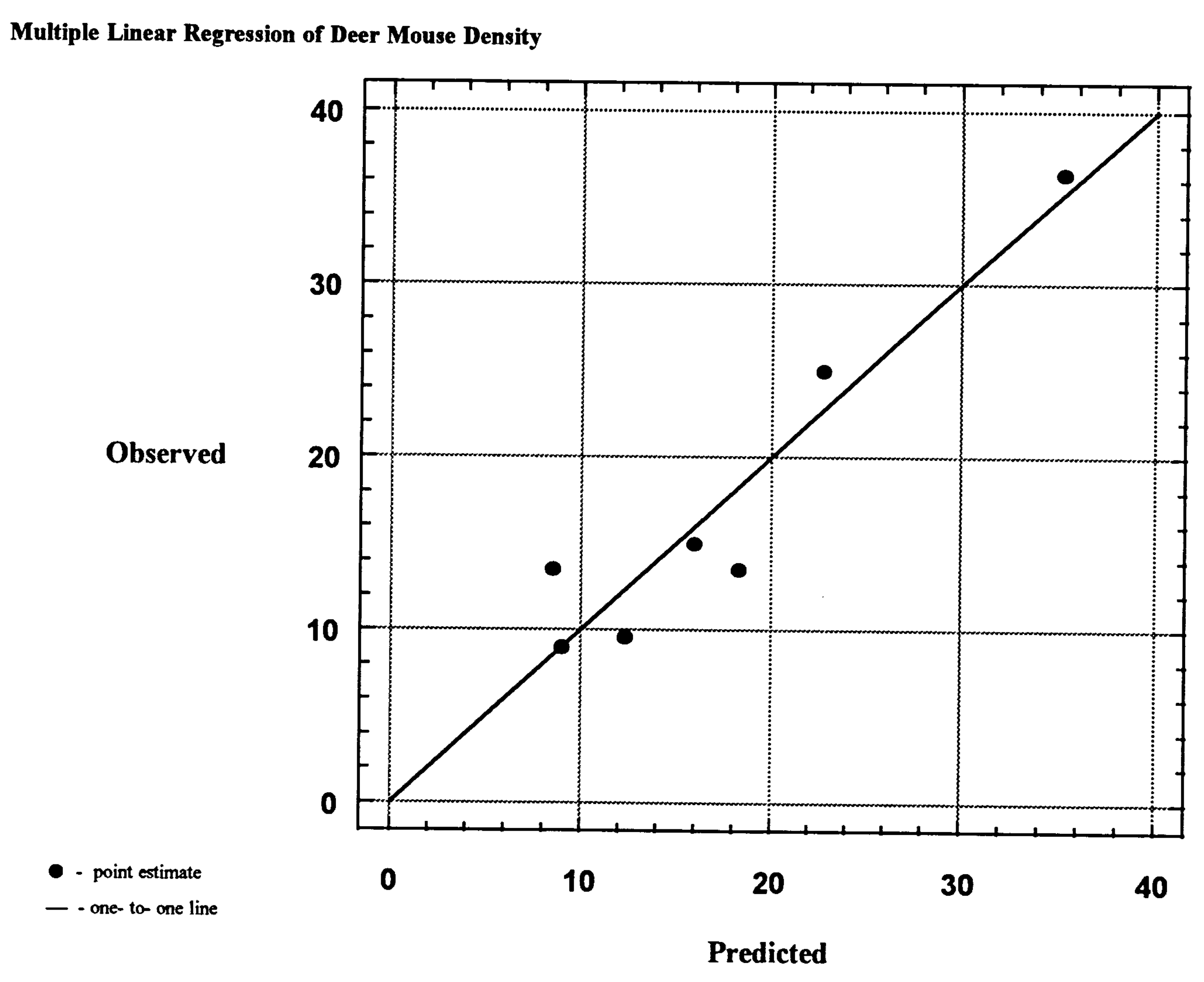


Figure 7-10. Observed Deer Mouse Density Data Versus Predicted Values by Linear Regression

7.2.3.3.2 ***Relative Diversity of Small Mammal Species.*** The species diversity was calculated with the Shannon-Wiener index, which considers the number of species (s), the number of individuals (N), and the proportion of the total that occurs for each species (Brower and Zar 1977). The index is appropriate when the data are a random sample from the community.

The equation for the diversity index is:

(Equation 7-27)

$$H' = -\Sigma\, p_i \log p_i$$

where

p_i = proportion of total individuals occurring in species *I*

Values for species diversity were reported in Table 7-18. As can be seen in Figure 7-11 and Table 7-18, both diversity and density were highest at the RSA. The diversity data were analyzed in the same manner as the density data by multiple linear regression after examining the underlying data for normality and heteroschedasticity (i.e., degree of variability).

The multiple linear regression that was found to best describe the diversity data contains the habitat variables, bare ground, litter, and road (Table 7-19). Utilizing these three variables, 58 percent of the variability in species diversity could be described (r^2 equal to 0.583). Figure 7-12 presents the predicted versus the observed data for the multiple linear regression for small mammal diversity. The coefficients and significance levels for each of the variables in the regression are shown in Table 7-19.

Table 7-19. Coefficients and Significance for Variables in Multiple Linear Regression for Diversity Analysis

Variable	Coefficient	Significance
Bare ground	-0.00522	0.426
Litter	0.01539	0.196
Road	0.0051	0.652
Constant	0.0311	0.94

Examination of the residuals versus the predicted values indicated no clear pattern, and the residuals generally fit a normal probability plot. Evidence, therefore, suggests that physical disturbance plays a large role in the variability observed in the small mammal population data.

The data collected for the small mammal density and diversity are striking in that so high a correlation between these two population variables was observed relative to several indices of physical disturbance. However, the results are possibly confounded by whether or not the chemical contamination at these locations varies with physical disturbance as well. Whereas the vegetation transect and small mammal trapping data were randomly collected, the abiotic analytical data are biased (i.e., collected from known areas of disturbance and chemical contamination). Small mammal diversity was also examined against cadmium, lead, and zinc in soil ($r^2 = 0.01$); however, there was less association with these inorganics than with habitat variables.

7.2.3.3.3 ***Small Mammal Body Weight, Sex Ratio, and Age.*** Small mammals were weighed and their sex was determined in the field. However, some animals escaped during handling, resulting in missing data for weight, sex, and age. These mammals were included, however, for determining species density and abundance. The data for small mammal body weight by area and species are presented in Figure 7-13. Only the deer mouse was collected at all areas trapped. Therefore, data for the deer mouse were explored statistically, whereas the data for the other species were not.

A KW test was performed on deer mouse body weight by area. The data indicate a significant difference by area (p less than 0.0026). Deer mice from SWMUs 12/15 were heavier than deer mice from all the other locations trapped (Figure 7-14). Deer mice from SWMUs 10/11 and 45 were lighter than those from the RSA and all other SWMUs.

Sex and age are categorical data and were evaluated with the chi-square test (χ^2). The data were first evaluated by the age variable. A χ^2 test (with alpha equal to 0.05) was used to analyze the frequencies for difference from the RSA; however, due to below expected frequency of juveniles, the results are slightly suspect. The χ^2 test evaluates the null hypothesis, H_0, that specifies population probabilities or proportions of the various categories.

The test statistic is:

$$\chi^2_{sex} = \sum \frac{(O-E)^2}{E} \qquad \text{(Equation 7-28)}$$

The summation is over all categories; "O" is the observed frequency of juveniles at an ESA SWMU, and "E" is the expected frequency of juveniles at the RSA. The null hypothesis is as follows:

H_0 = Probability of capturing juveniles at TEAD is the same as at the RSA

The probability of capturing juveniles was estimated by dividing the number of juveniles at an ESA SWMU by the total number of deer mice at that SWMU relative to the total number of deer mice captured at the RSA. The test results show that significantly more subadults (p equal to 7.3E-09) were present at SWMUs 10/11 than at the RSA (Figure 7-15). There were

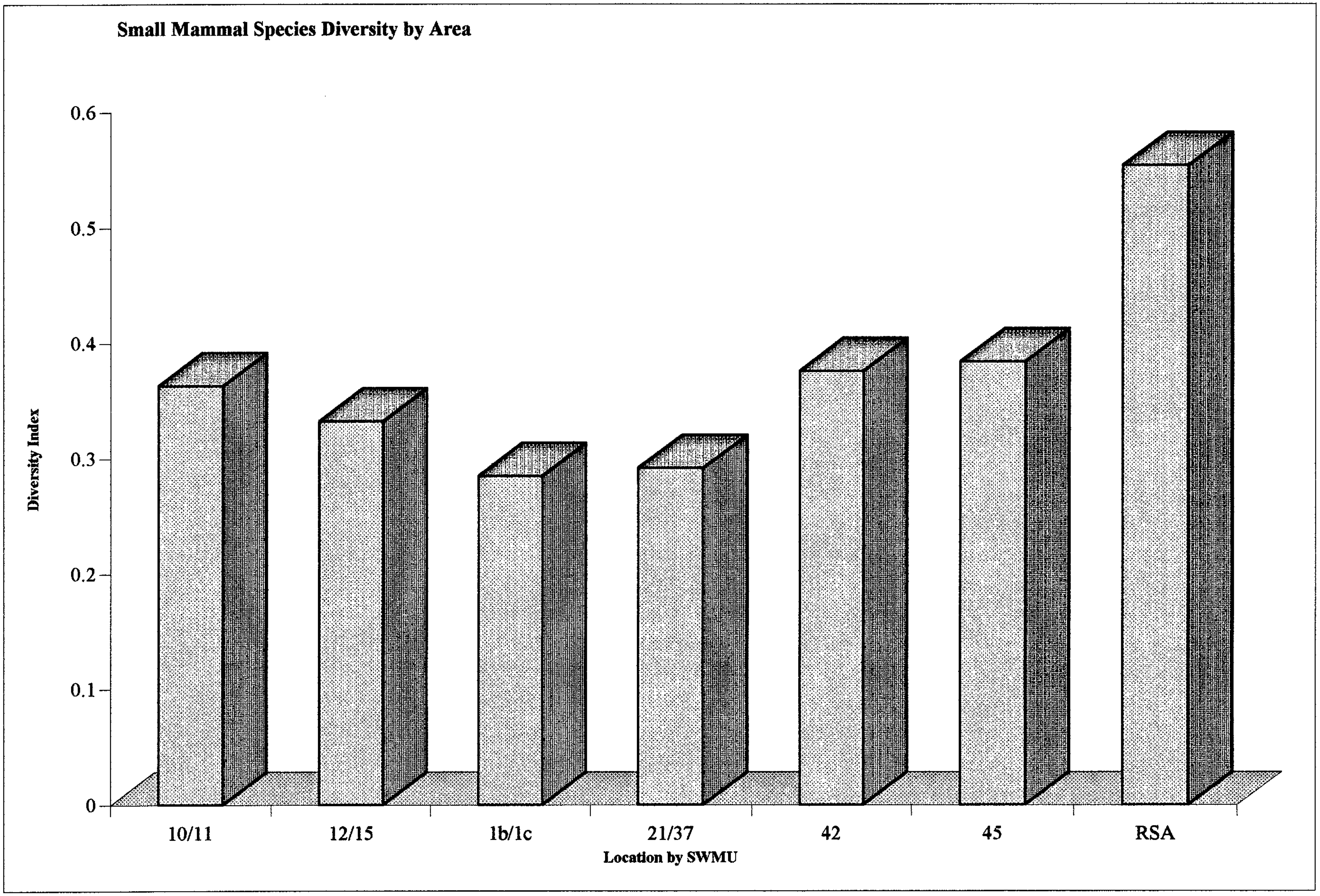


Figure 7-11. Small Mammal Species Diversity by Location

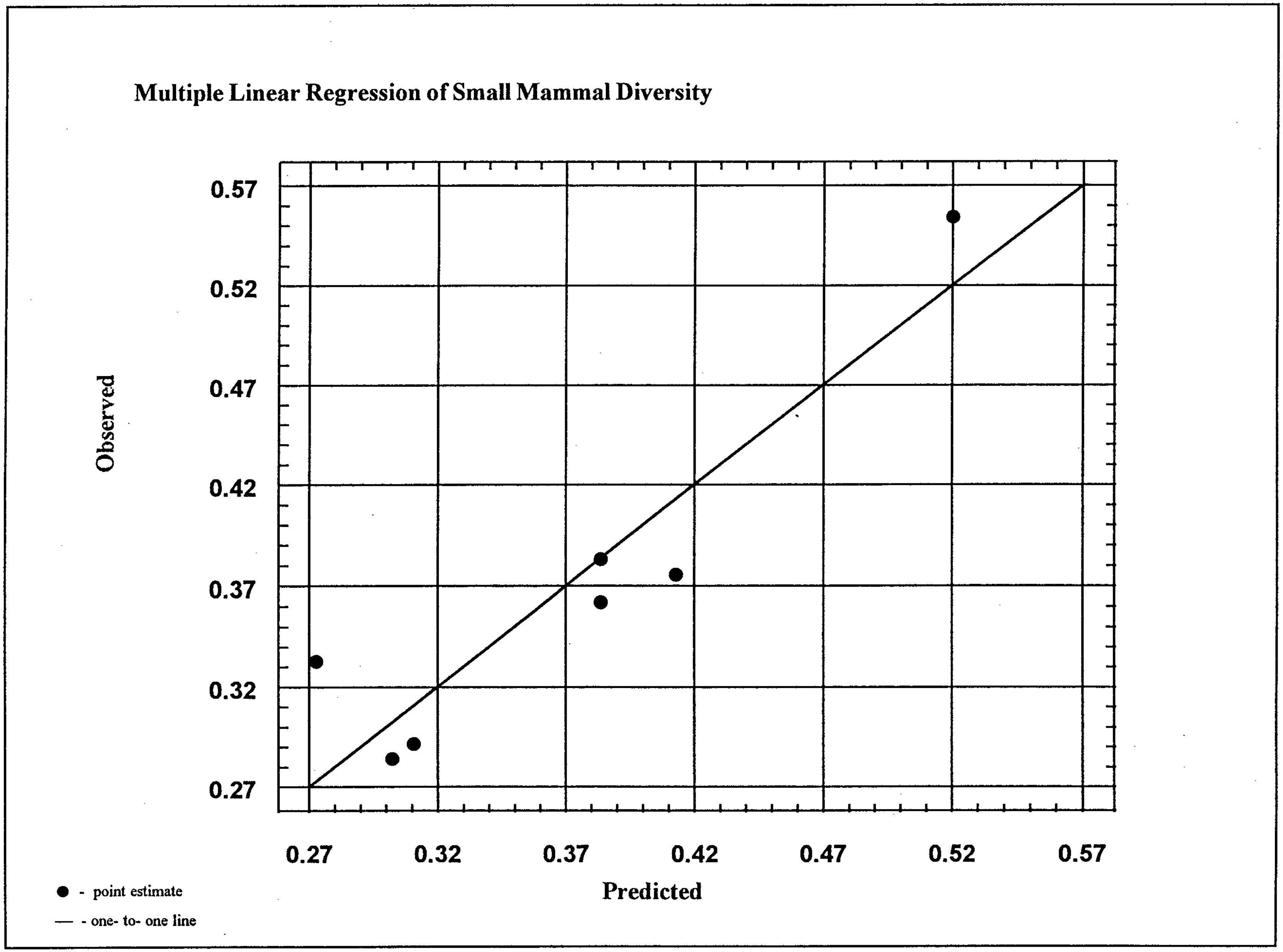


Figure 7-12. Multiple Linear Regression of Small Mammal Diversity

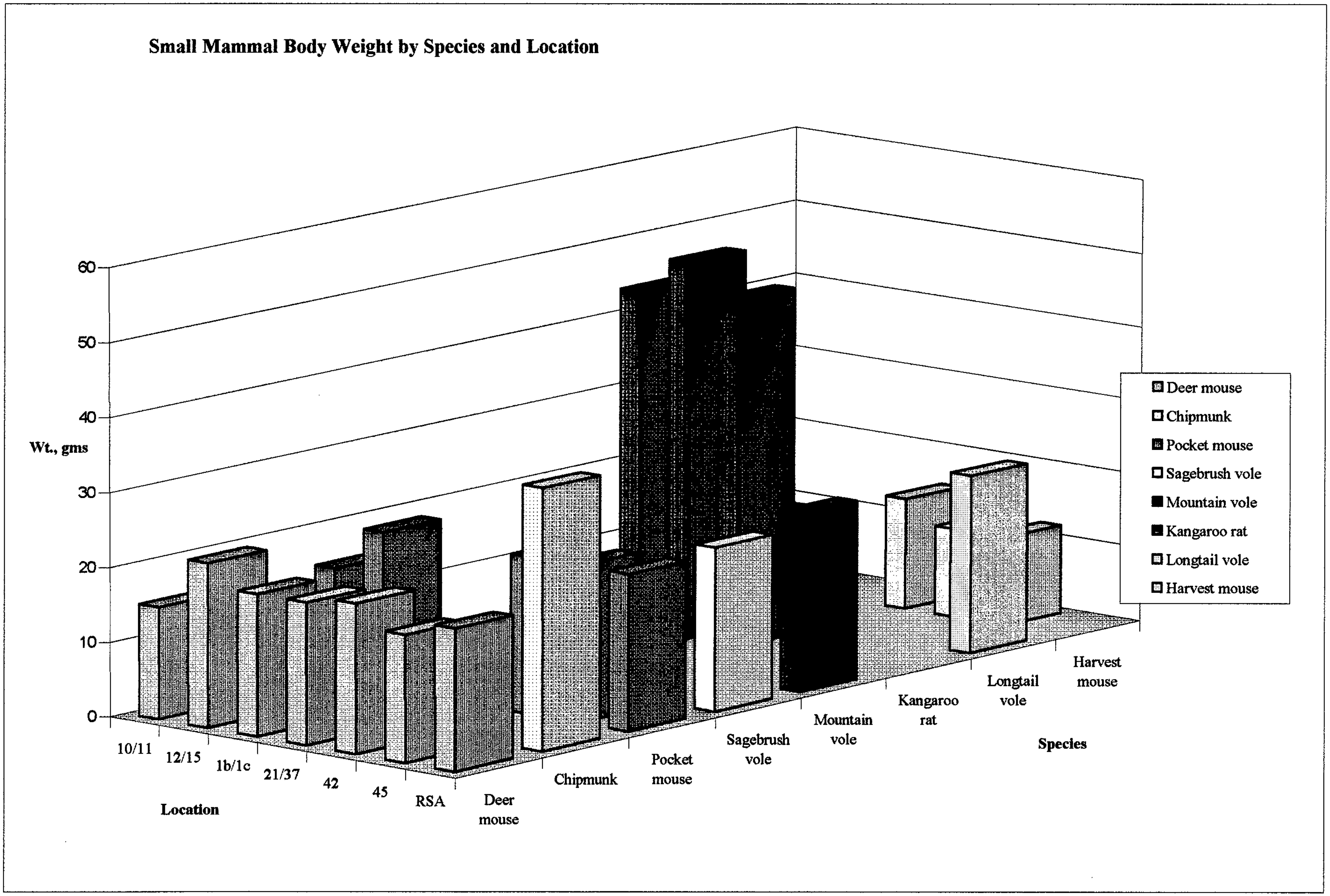


Figure 7-13. Small Mammal Body Weight by Species and Location

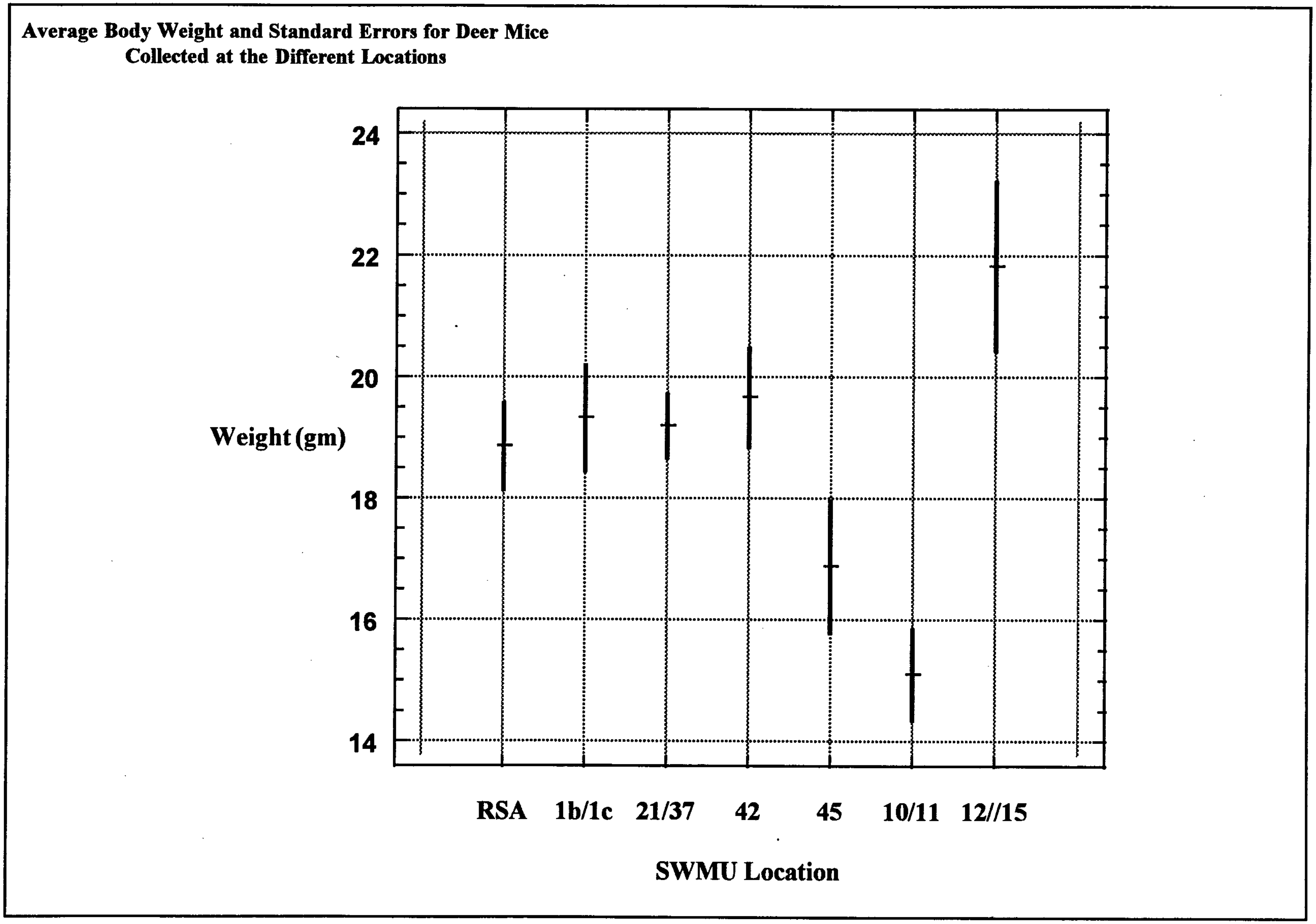


Figure 7-14. Deer Mouse Body Weight and Standard Error by Location

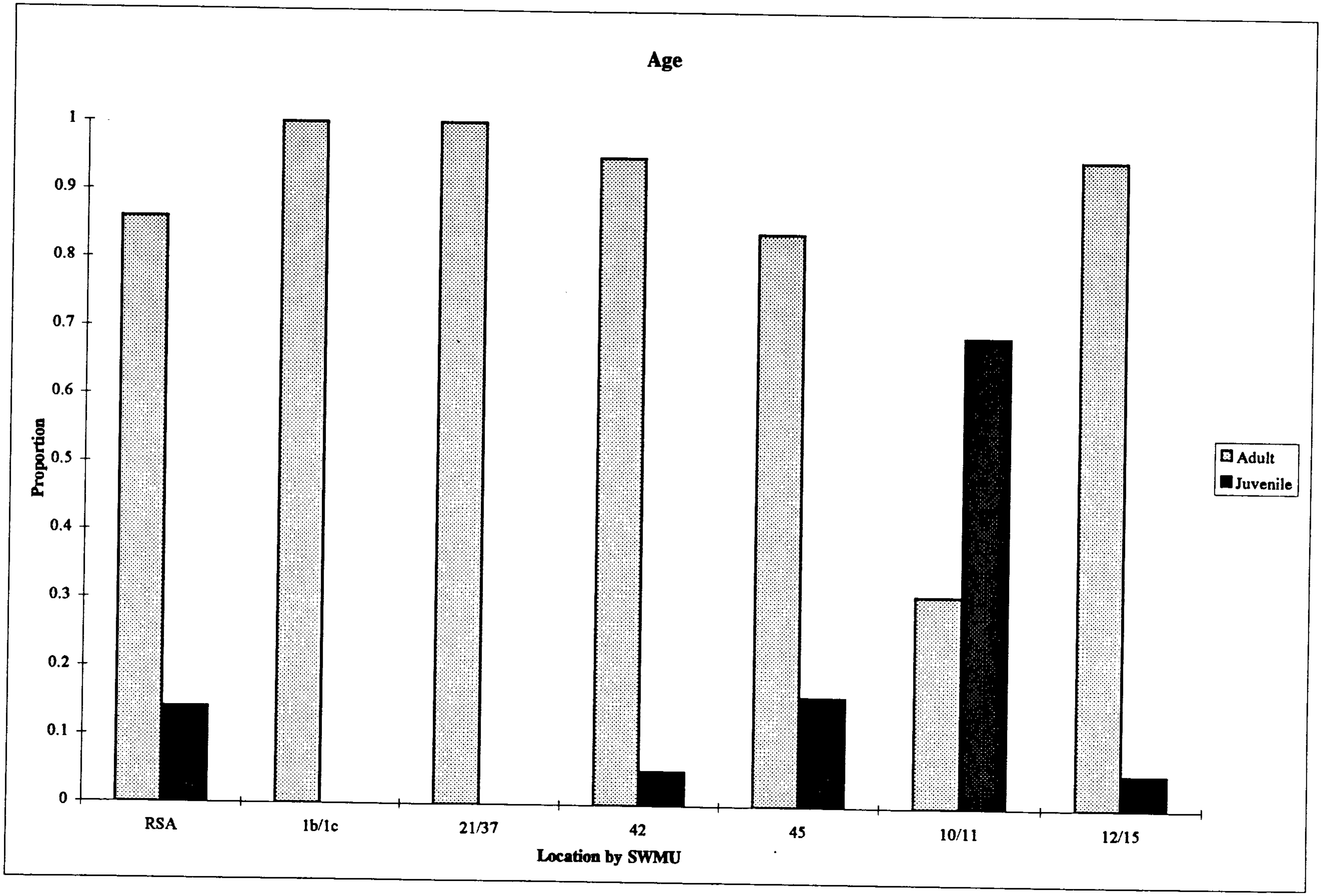


Figure 7-15. Deer Mouse Proportion of Juveniles to Adults by Location

significantly fewer subadults (p equal to 0.02) collected from SWMUs 21/37 than from the RSA. Fewer juveniles than expected were collected at SWMUs 12/15, although the difference was not significant (p equal to 0.26). Age does not explain the difference in body weight at SWMU 45. A conclusion drawn from the review of the data was that age influenced measured body weight to some extent. The reasons for the disparity in age of the trapped small mammals are not apparent from the limited data available. There could have been a higher number of juveniles in the population; juveniles could have been dispersing; or food supplies could have been limited, which might force juveniles to be less selective than adults about entering the traps. Random variability could also have been a factor with such a limited data set. Data collected over an entire season or during multiple years could produce different results. However, the data do not show a significant trend that small mammal populations on TEAD are less likely to successfully reproduce or that body weight is depressed at TEAD relative to the RSA.

Sex differences for deer mice were not significantly different at the alpha (equal to 0.05) level at most locations by a χ^2 test. In general, the deer mouse sex ratio was approximately 1:1 (Figure 7-16). At SWMU 42, the sex ratio was skewed significantly (p equal to 0.05) toward males.

7.3 TOXICITY ASSESSMENT

The COPCs at TEAD, as described in Section 2.2.2, include metals, pesticides/PCBs, dioxins/furans, explosives, and a variety of VOCs and SVOCs. The toxicity of these chemicals to terrestrial plants, soil, soil fauna, birds, and wildlife, and environmental fate and transport, is discussed in the existing TEAD RI and RFI reports. Refer to Table 3-5 in *Draft Final RFI For Group C SWMUs* (SAIC 1996b); Appendix L, *Revised Final RFI For Group A SWMUs* (Montgomery Watson 1996); Table 4-9, *Revised Final Phase II RFI For Known-Releases SWMUs* (Rust E&I 1995a); and Appendix M, Attachment A, of the *Revised Final RI Addendum for OUs 4, 8, and 9* (Rust E&I 1997).

Table 7-20 summarizes the toxicological studies reviewed for birds and mammals for the oral ingestion pathway. (**Note**: Tables 7-20 through 7-130 are located at the end of Section 7.0.) Toxicological data for plants and soil fauna are reported in Table 7-21. Where data were unavailable for birds and wildlife, data for laboratory animals were reported. Screening criteria, or TBVs, were selected from the literature values and represent concentrations that, if exceeded at a particular location, might indicate a potential risk to ecological receptors.

Many values for birds and mammals were reported as dietary concentrations (i.e., mg/kg diet or ppm). Dietary concentrations were converted to intakes (mg/kg body weight/day) using dietary ingestion rates. The conversion factors applied to each toxicity value are described in Table 7-20.

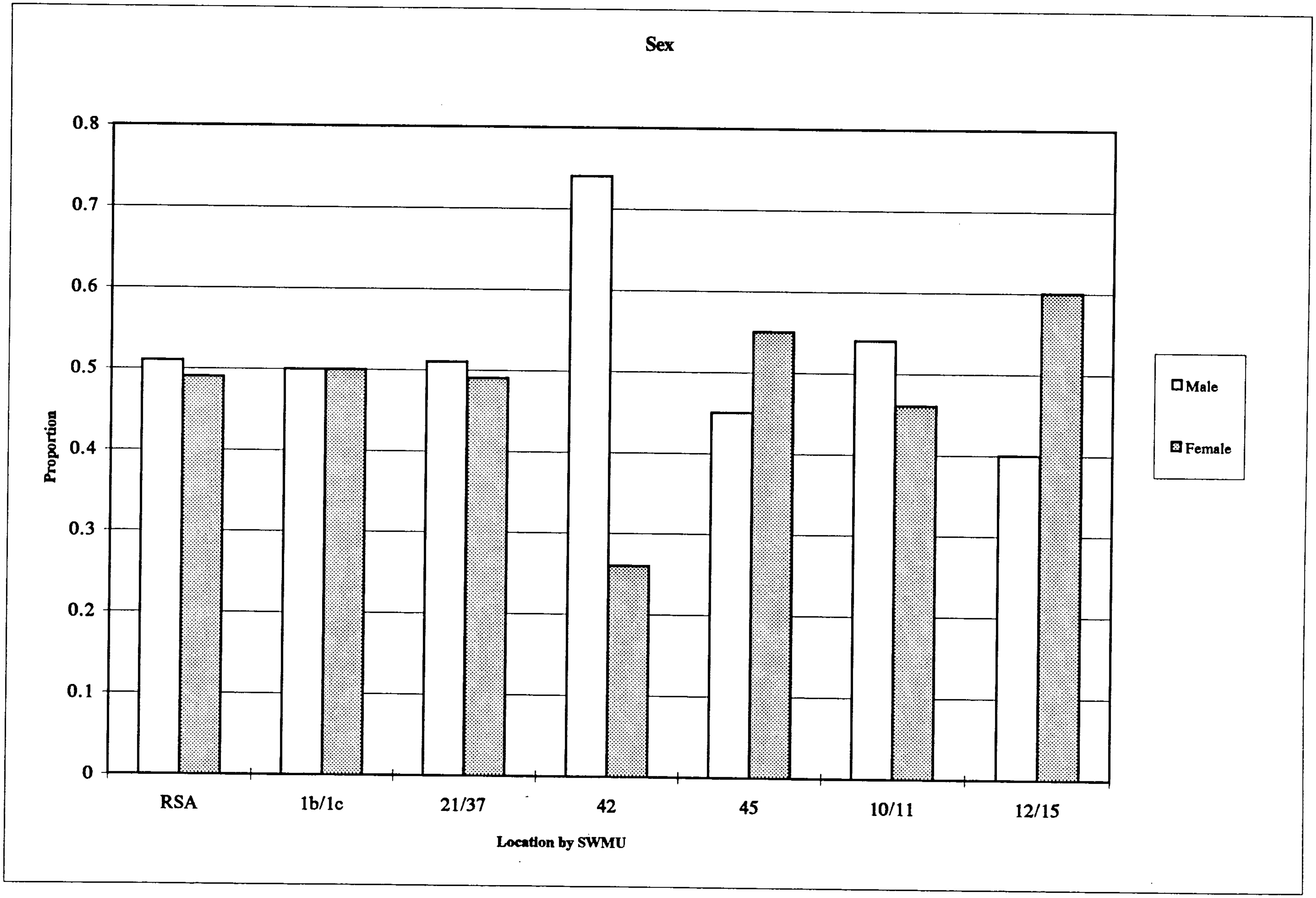


Figure 7-16. Proportion of Male to Female Deer Mice by Location

In the toxicity assessment, toxicological data pertinent to the evaluation of ecological risk were reviewed and summarized. The following data sources were evaluated for toxicity information:

- Toxline (an online database specializing in toxicological data)
- USEPA documents
- Other sources including IRIS, HEAST, HSDB, and ATSDR

The toxicity assessment focused on endpoints or health effects that were likely to adversely affect populations of ecological receptors at the site, as opposed to health effects such as cancer, which occurs on an individual basis. This is consistent with current ecological risk assessment guidance. Health effects that potentially impact populations include increased mortality, high rates of morbidity, and reproductive effects. For the purposes of the risk assessment, reproductive effects include developmental effects (i.e., fetotoxicity and embryotoxicity), as well as indices of reproductive success such as litter size. Carcinogenicity and mutagenicity were not used as endpoints for the ecological risk assessment as these are effects that alter an individual's chance of survival. If cancer rates were very high, the endpoint for the population would be survival.

If evaluation of the ingestion pathways fail to show an ecological risk, dermal pathways are unlikely to produce a significant risk because the absorption coefficients for intact skin tend to be less than 1 (i.e., only a fraction of the concentration is bioavailable for absorption), especially when chemicals are bound to organic materials in soil. The inhalation exposure pathway was evaluated at several locations where air modeling was performed (Rust E&I 1995a).

The literature was reviewed for data regarding no observed adverse effects levels (NOAELs). Chronic studies, wherein ecological receptors are exposed for entire lifetimes, were considered preferable to studies of shorter duration. If NOAELs were unavailable, the lowest observed adverse effects level (LOAEL) or other toxicity values were used. Where data were available, toxicity values for wildlife species likely to be found at TEAD were used. Where possible, data from short-term studies (i.e., single dose or less than a week) and dose levels or dietary intakes that resulted in mortality were avoided.

The most pertinent studies for birds and mammals are summarized in Table 7-20, and those for plants and soil fauna are presented in Table 7-21. In order to select the most appropriate value to use as a final TBV, the following criteria were considered:

- Overall strength of the study
- Similarity of the test species to the key receptors
- Magnitude of the total applied uncertainty factors, which is related to the first two items

Following discussions with the USEPA, the State of Utah, the USAEC, and Rust E&I, an approach was agreed upon for the development of uncertainty factors (UFs) for TEAD (USEPA 1995c). Table 7-22 presents the uncertainty factors used in the SWERA, which

include uncertainty factors for intertaxon differences, sensitive species endpoints (Tables 7-23 and 7-24), and for ecotoxicological study duration endpoints (Table 7-25).

Intertaxon extrapolation uncertainty factors adjust for the taxonomic differences between the TEAD receptors and the species used in the toxicological tests cited in Table 7-20. The premise is that there is less uncertainty when the test species is more closely related to the TEAD receptor. The maximum uncertainty for this category was 5, which was applied if the test species was in the same class as the TEAD receptor, but in a different order. Data were not extrapolated between taxonomic class (i.e., data for mammals were not applied to birds). When the TEAD receptor represented a special status species, the intertaxon UF was multiplied by 2 (Table 7-22). Table 7-23 reports the intertaxon and Special Status UFs for each study and receptor. The taxonomic classification is given in Table 7-24.

Uncertainty factors were also applied to adjust the TBV to reflect the study duration. Long-term studies are preferable to short-term studies and carry less uncertainty (Table 7-22). In addition, a category for toxicological study endpoint was applied. NOAEL studies were preferable to studies that resulted in adverse effects (Table 7-22). The magnitude of the UFs increase as the severity of the effects increases, particularly to levels most likely to have population effects. Table 7-25 reports the UFs assigned to each TBV to adjust for study duration and endpoint. Toxicity equivalency factors (TEFs) were applied to the TBVs for the dioxins/furans based upon USEPA guidance (USEPA 1989f). Application of the TEFs for human health risk assessment provides for the multiplication of the cancer slope factor times the TEF to obtain a lower toxicity value. This approach cannot be strictly followed for ecological risk assessment purposes; however, the final TBV was divided by the corresponding TEF. This approach is mathematically equivalent to the newer draft USEPA guidance (USEPA 1994d). In order to avoid "divide by zero errors" when calculating final HQs, a value of 0.001 was substituted instead for those values where the newer guidance recommended a "zero" TEF. The TEFs used in the SWERA are summarized in Table 7-26.

Utilizing the developed uncertainty factors, the toxicity equivalency factors, and the final list of COPCs, tables of final TBVs for avian and mammalian receptors (Table 7-27) and for plant and soil fauna (Table 7-28) were developed.

The UFs for each category were multiplied, and the TBV was divided by the product of the UFs. As per ETAG consensus, when the total UF exceeded 500, the analytes were addressed semi-quantitatively in the risk assessment conclusions.

7.4 TERRESTRIAL ECOSYSTEM RISK CHARACTERIZATION

7.4.1 Hazard Quotients

Hazard quotients were calculated for the terrestrial ecological receptors for the soil and surface water ingestion pathways and the dietary ingestion pathway. The only exposure pathway quantitatively evaluated for plants and soil fauna was the direct soil contact pathway. The

inhalation pathway (based on historic data) was evaluated for the two receptors most likely to burrow, the deer mouse and kit fox.

The aquatic risk assessment ecosystem, SWMU 14 Sewage Lagoons, is presented in its entirety in Section 7.5.

The risk characterization was performed by comparing the exposure intakes (or doses) from soil, diet, and surface water to the TBVs for birds and mammals in order to obtain an HQ. The Cterm soil concentration was compared directly to the TBVs for plants and soil fauna in order to obtain the HQ. The HQ is, thus, a ratio of the exposure point concentration (i.e., Cterm) to the appropriate TBV.

For birds and mammals, the HQ is calculated by:

$$HQ = \text{Exposure Intake}_{(mg/kg\ bw/day)} \, / \, TBV_{(mg/kg\ bw/day)} \qquad \text{(Equation 7-29)}$$

For plants and soil fauna, the HQ is calculated by:

$$HQ = \text{Cterm}_{(mg/kg)} \, / \, TBV_{(mg/kg)} \qquad \text{(Equation 7-30)}$$

For the sake of comparison, HQs were calculated on the RSA data based on the Cterm, and HQs were also calculated for the RSA and for the TEAD background data on the basis of the UBCs. In part, this was done to verify the appropriateness of the TBVs and to identify risks inherent in the TEAD background data on the RSA. When the TBVs produce high HQs with the RSA and the TEAD background data, it indicates that the TBV is inappropriate for these locations. Due to the large sizes of both TEAD and the RSA, an AUF equal to 1 for all receptors was assumed.

Risks based on inorganics in TEAD background samples were compared to the risks at the RSA in order to make the assessment more realistic. Tables 7-29 and 7-30 present the HQs and HIs based upon UBCs for both TEAD and the RSA. As described in Section 2.2.1, the UBC is represented by the:

- CRL if no detects, or
- Highest detect, or
- Arithmetic mean + 2 standard deviation, if normal
- Geometric mean + 2 geometric standard deviation, if lognormal

7.4.1.1 *Hazard Quotients for Terrestrial Ecological Receptors*

Due to the large amount of data, all HQs for each exposure pathway and receptor are provided in Appendix I. HQs were calculated for each receptor at each TEAD location and at the RSA for each analyte. Three sets of data were available for these calculations:

- **Historic Data** - TEAD historic soil and sediment data—All TEAD SWMUs that passed the COPC screening, including the ESA SWMUs, are addressed in this data set. This includes the limited surface water data at SWMUs 11, 21, 23, and 45. Biological data were not collected in the historic sampling programs.

- **Current Data Reported by SWMU** - Co-located soil and biota data—The RSA, and SWMUs 1b, 1c, 10, 11, 12, 15, 21, 37, 42, and 45 are addressed in this data set. This includes limited surface water data at SWMUs within ESA-1 and ESA-2. No surface water data were available for the RSA.

- **Current Data Reported by ESA** - Co-located soil and biota data—SWMUs 1b, 1c, 10, 11, 12, 15, 21, and 37 are incorporated into ESA-2, while ESA-1 is comprised of SWMUs 42 and 45. This includes limited surface water data at SWMUs within ESA-1 and ESA-2. No surface water data were available for the RSA.

The HQs are analyte, receptor, and exposure-pathway specific (Appendix I). The HQs were summed based upon their group classification (Table 2-9, Section 2.2.2.1); for example, the HQs for DDT and DDE were summed to make a DDT_R HQ. This reduced the number of COPCs without reducing the overall apparent risk.

There were HQs for up to four plant species and up to two invertebrate species. The HQs for each matrix were averaged to obtain a single HQ for plants and a single HQ for invertebrates.

A dietary HQ for each COPC group was obtained for each receptor by evaluating which dietary components were applicable to each receptor as follows:

- Passerines: 33% plant, 33% invertebrate, 33% jackrabbit
- American Kestrel: 50% invertebrate, 50% jackrabbit
- Great Horned Owl: 100% jackrabbit
- Golden Eagle: 100% jackrabbit
- Bald Eagle: 100% jackrabbit
- Deer Mouse: 50% plant, 50% invertebrate
- Mule Deer: 100% plant
- Kit Fox: 50% jackrabbit, 50% invertebrate

Appendix I presents the HQs obtained for each receptor for soil, dietary, and surface water ingestion, as appropriate. The HQs were then summed by exposure pathway (HQ_{EP}) to obtain an HQ_{EP} for each analyte group and receptor. The HQ_{EP}s were then summed to obtain an HI for each location and receptor.

7.4.1.1.1 ***Passerine Birds.*** **Historic Data**—The HQs for the soil and surface water exposure pathways were calculated from the historic abiotic data for the ecological receptors at TEAD (Appendix I). Data were extremely limited for surface water; no HQs exceeded 1 for the surface water ingestion pathway. Dietary ingestion was not estimated for the historic data.

The HQs for soil ingestion for silver, arsenic, barium, cadmium, chromium, copper, iron, manganese, nickel, lead, selenium, thallium, and zinc at some locations on TEAD exceeded 1 and exceeded HQs at the RSA. The HQ for mercury for soil ingestion exceeded 1 at SWMU 27. In general, the highest and most frequent exceedances were observed for lead.

Chlordane and dieldrin HQs for soil ingestion exceeded 1 at SWMU 45. Dioxin/furan HQs exceeded 1 at SWMUs 10, 15, 37, and 42; however, the HQ at the RSA was higher than those at SWMUs 10 and 15. The HQ for DDT exceeded 1 at SWMUs 29, 34, 35, 42, and 45. The HQs for endrin at SWMUs 34 and 35 exceeded 1. There was an exceedance at SWMU 23 for PCBs, and at SWMUs 11, 14 and 45 for phthalates. TPHC HQs exceeded 1 only at SWMUs 28, 29, 46, and 47.

Current Data Reported by SWMU—HQs for seven metals exceeded 1 for both the diet and soil pathways: barium, cadmium, chromium, copper, iron, lead, and zinc. Of these metals, the highest diet HQs were seen for lead at SWMU 11 (HQ = 118) and SWMU 21 (HQ = 23). Soil pathway HQs were highest among these metals for iron at SWMU 11 (HQ = 88) and SWMU 15 (HQ = 67). In addition, dietary pathway HQs over 1 were calculated for selenium (11 values ranging between 2.1 and 3.5). Soil pathway HQs of 49 were calculated for thallium for all SWMUs except SWMU 21 (HQ = 20.5) although there were no detects for thallium, and the HQs were calculated based on nondetects at 1/2 the CRL. Other dietary pathway HQs over 1 occurred for pesticides (maximum HQ of 4.1 at SWMU 15) and dioxin/furan compounds. The dioxin/furan HQs were over 50 for SWMUs 1b, 1c, 10, 11, 12, 15, 37, and 42. Other soil pathway HQs over 1 were all from SWMU 45: dioxin/furans (HQ = 9.7), endrin (HQ = 5), PCBs (HQ = 3.5), and phthalates (HQ = 6.7). All water pathway HQs calculated for the passerine birds were negligible.

Current Data Reported by ESA—HQs calculated for the diet pathway on an ESA basis (ESA-1, ESA-2, and the RSA) were generally less than 1. Exceptions included several metals: barium, cadmium, chromium, copper, iron, lead, selenium, and zinc. Most of the HQs for these metals were less than 5; however, the highest values were over 24 for lead at ESAs 1 and 2 (RSA lead HQ was 3.5) and 17 for zinc at ESA-2 (ESA-1 and RSA HQs for zinc were approximately 8). The HQ of 62.8 for dioxins/furans at ESA-2 was the greatest of all calculated for passerine birds; the values were 1.2 for ESA-1 and 10.6 for the RSA. Similarly, the maximum HQs calculated for the soil ingestion pathway were for metals. The highest values were observed for thallium at all three locations (HQ = 49.2). It should be noted that there were no detects of thallium in soil at any of the three areas, and the HQs are all calculated based upon nondetects (NDs) at 1/2 the CRL. All other values were less than 10 except for chromium (17.5 at ESA-1, 11.3 at ESA-2), iron (approximately 20 at the RSA and ESA-1, 35.7 at ESA-2), and lead (22.9 at ESA-1, 19.1 at ESA-2). In addition, HQs over 1 were calculated for dioxin/furans, PCBs, and phthalates, the largest being 8.2 for dioxin/furan compounds at the RSA and ESA-1. All HQs calculated for the water ingestion pathway for passerine birds were negligible.

7.4.1.1.2 ***American Kestrel.*** **Historic Data**—The HQs for the soil and surface water exposure pathways were calculated for the ecological receptors at TEAD (Appendix I). Data were extremely limited for surface water (SWMUs 11, 23, and 45); no HQs exceeded 1 for the surface water ingestion pathway. Dietary ingestion was not estimated for the historic data.

The HQs for soil ingestion for chromium, copper, iron, lead, thallium, and zinc at some locations on TEAD exceeded 1, and except for thallium, exceeded HQs at the RSA.

Current Data Reported by SWMU—HQs calculated for this species were generally very low for all pathways. The only HQs above 1 for the diet pathway were for dioxin/furans (3.1 for the RSA, 1.4 for SWMU 1c, 1.1 for SWMU 12, 3.6 for SWMU 15, 2.5 for SWMU 42) and zinc (1.9 for the RSA, 1.5 for SWMU 15). Soil pathway HQs above 1 were calculated only at the RSA: iron (HQ = 1.1) and thallium (all NDs) (HQ = 2.8). All water pathway HQs calculated were negligible.

Current Data Reported by ESA—HQs calculated for this species were generally very low for all pathways. The only HQs above 1 for the diet pathway were for dioxin/furans (3.1 for the RSA, 7.4 for ESA-2) and zinc (1.9 for the RSA, 1.6 for ESA-2). Soil pathway HQs above 1 were for iron (1.1 for the RSA) and thallium (all NDs) (2.8 for the RSA, 1.1 for ESA-2).

7.4.1.1.3 ***Great Horned Owl.*** **Historic Data**—None of the HQs for this receptor for either the soil or surface water ingestion pathways exceeded 1.

Current Data Reported by SWMU—All HQs for all pathways were less than 1 for the great horned owl.

Current Data Reported by ESA— All HQs for all pathways were less than 1 for the great horned owl.

7.4.1.1.4 ***Golden Eagle.*** **Historic Data**—All of the HQs for soil or surface water ingestion from TEAD for the golden eagle were less than 1. As a comparison, ingestion of thallium in soil at the RSA (based on NDs) resulted in an HQ that exceeded 1.

Current Data Reported by SWMU—There were only two HQs greater than 1 for the golden eagle, both at the RSA: diet pathway—an HQ of 1.2 for lead, and soil ingestion pathway—an HQ of 2.5 for thallium (based on NDs).

Current Data Reported by ESA—There were only two HQs greater than 1 for the golden eagle, both at the RSA: diet pathway—an HQ of 1.2 for lead, and soil ingestion pathway—an HQ of 2.5 for thallium (based on NDs).

7.4.1.1.5 *Bald Eagle.* **Historic Data**—All of the HQs for soil or surface water ingestion from TEAD for the bald eagle were less than 1. As a comparison, ingestion of thallium in soil at the RSA resulted in an HQ that exceeded 1.

Current Data Reported by SWMU—HQs calculated for the bald eagle on a current basis are the same as for the golden eagle: an HQ of 1.2 for lead at the RSA for the diet pathway and an HQ of 2.5 for thallium at the RSA for the soil pathway.

Current Data Reported by ESA—As with the golden eagle, there were two instances where the HQ was greater than 1, both in the RSA. One case was for the diet pathway: an HQ of 1.2 for lead, and the other case for the soil ingestion pathway: thallium at 2.5 (based on nondetects).

7.4.1.1.6 *Deer Mouse.* **Historic Data**—The HQs for the soil pathway were calculated for the deer mouse at TEAD (Appendix I). Dietary ingestion was not estimated for the historic data. The HQs for soil ingestion for antimony, aluminum, barium, copper, iron, lead, thallium, and zinc at some locations on TEAD exceeded 1, and except for thallium, exceeded HQs at the RSA. The HQs for the soil ingestion pathway for TNT and RDX exceeded 1 for several SWMUs and exceeded HQs for the RSA.

The HQ for PAHs for the soil ingestion pathway exceeded 1 only at SWMU 15. Aldrin/dieldrin in soil resulted in an HQ in excess of 1 at SWMU 45 for the soil ingestion pathway. TPHC in soil at SWMU 47 resulted in an HQ above 1 for the soil ingestion pathway.

Dioxin/furan HQs also exceeded 1; however, the HQ at the RSA was higher than at most of the TEAD sites. The widespread occurrence of dioxins/furans suggests that the dioxin/furan contamination is not site related. However, the HQs for SWMUs 37 and 42 for dioxin/furans exceeded the value for the RSA for the soil ingestion pathway.

HQs for water ingestion were not calculated for deer mice; however, exposure by the inhalation pathway was addressed. The air inhalation exposure pathway HQs are presented in Appendix I. All HQ values were very low and were not used in the calculation of HIs in Section 7.4.2.

Current Data Reported by SWMU—Both diet and soil ingestion pathway HQs for the deer mouse were greater than 1 for several metals—aluminum, copper, iron, lead, and zinc—and for dioxin/furans. Most HQs were less than 10. However, the values for dietary HQs for dioxin/furans ranged between 3 and 73 for the 10 SWMUs with an HQ of 20 at the RSA. Other dietary HQs above 1 were calculated for barium (7.5 at SWMU 42), selenium (11 HQs between 1.3 and 2.4), and pesticides (1.2 at SWMU 45). Dietary pathway values for explosives were generally higher: 2,4,6-TNT (maximum of 23.3 at SWMU 10) and RDX (over 1,400 at SWMU 10). For the soil ingestion pathway, HQs greater than 1 were estimated for thallium (11 values of 5 or less, all based on NDs) and PAHs (15.5 at SWMU

15). The HQs for iron by the soil pathway for the 10 SWMUs plus the RSA ranged from 3.3 to 65 (at SWMU 11). HQs for water ingestion were not calculated for deer mice.

Current Data Reported by ESA—The dietary ingestion pathway HQs for the deer mouse were greater than 1 for several metals—aluminum, barium, copper, iron, lead, and zinc; explosives—2,4,6-TNT and RDX; 2,4-D; and dioxin/furans. Most values were 5 or less. However, the values for dioxin/furans ranged up to 75 at ESA-2 (HQ of 20 at the RSA), and the values for RDX ranged from 10 at the RSA to over 150 at ESA-2. For the soil ingestion pathway, HQs greater than 1 were calculated for the metals aluminum, copper, iron, lead, and thallium; dioxin/furans; and PAHs. All other values, except for iron, were 5 or less. The HQs for iron for the soil ingestion pathway ranged from 14.5 at the RSA to 26.4 at ESA-2. HQs for water ingestion were not calculated for deer mice.

7.4.1.1.7 ***Mule Deer.*** **Historic Data**—The HQs for the soil and surface water exposure pathways were calculated for the mule deer at TEAD (Appendix I). Data were extremely limited for surface water; no HQs exceeded 1 for the surface water ingestion pathway. Dietary ingestion was not estimated for the historic data.

The HQs for soil ingestion for copper, iron, and lead at some locations on TEAD exceeded 1 and exceeded HQs at the RSA. The HQs for the soil ingestion pathway at SWMU 11 for TNT and RDX also exceeded those at the RSA as well as exceeded 1.

Current Data Reported by SWMU—Only two HQs above 1 were estimated for the mule deer at a TEAD SWMU: RDX at SWMU 10 for diet (HQ = 4.7) and iron at SWMU 15 for the soil pathway (HQ = 1.7). All water pathway HQs calculated were negligible.

Current Data Reported by ESA—There were five HQs above 1 for the mule deer dietary pathway: 2,4,6-TNT at the RSA (HQ = 2.2); dioxin/furans at the RSA (HQ = 1.1) and ESA-2 (HQ = 3.8); and RDX at the RSA (HQ = 3.3) and at ESA-2 (HQ = 22.8). For the soil ingestion pathway, only iron produced HQs greater than 1: 1.9 calculated for the RSA and 1.6 at ESA-2. All water pathway HQs calculated were negligible.

7.4.1.1.8 ***Jackrabbit.*** **Historic Data**—The HQs for the soil and surface water exposure pathways were calculated for the jackrabbit at TEAD (Appendix I). Data were extremely limited for surface water; no HQs exceeded 1 for the surface water ingestion pathway. Dietary ingestion was not estimated for the historic data.

The HQs for soil ingestion for aluminum, antimony, barium, copper, iron, lead, thallium, and zinc at some locations on TEAD exceeded 1, and exceeded HQs at the RSA. The HQs for the soil ingestion pathway for TNT and RDX also exceeded those at the RSA as well as exceeded 1. The HQ for dioxin/furans at SWMU 42 for the soil ingestion pathway exceeded 1. Iron concentrations in soil resulted in the highest and most frequent exceedances for this receptor.

Current Data Reported by SWMU—HQs for the dietary pathway were above 1 for three metals—barium, iron, and lead; two explosives—2,4,6-TNT and RDX; and dioxin/furan compounds. All of the SWMU values were less than 5.6 except for RDX (51.4 at SWMU 10 and 8.4 at SWMU 15). For the soil ingestion pathway, HQs were above 1 for iron (maximum of 17.9 at SWMU 15), thallium (maximum of 1.6 at SWMU 15 based on NDs), and PAHs (5.5 at SWMU 15). All water ingestion pathway HQs calculated were negligible.

Current Data Reported by ESA—HQs for the dietary pathway were above 1 for three metals—barium, iron, and lead; two explosives—2,4,6-TNT and RDX; and dioxin/furan compounds. All of the metal HQs were less than 5. The HQs for 2,4,6-TNT ranged from 2.7 at ESA-1 to 6.1 at the RSA; those for RDX were RSA—9.3, ESA-1—8.5, and ESA-2—139.7. The HQ for dioxin/furans was 23. For the soil ingestion pathway, HQs were above 1 for three metals: aluminum, iron, and thallium (based on NDs); and PAHs. Only the HQs for iron (4.4 at ESA-1 to 9.7 at ESA-2) were above 2.

7.4.1.1.9 ***Kit Fox.*** **Historic Data**—The HQs for soil and surface water exposure pathways were calculated for the kit fox at TEAD (Appendix I). Data were extremely limited for surface water; no HQs exceeded 1 for the surface water ingestion pathway. Dietary ingestion was not estimated for the historic data.

The HQs for soil ingestion for aluminum, copper, iron, and lead at some locations on TEAD exceeded 1. Lead HQs were the only HQs that exceeded HQs at the RSA for inorganics. The HQs for the soil ingestion pathway for TNT and RDX also exceeded those at the RSA as well as exceeded 1 at SWMU 1. The HQs for cobalt, thallium, and dioxin/furans at the RSA were above 1 for the soil ingestion pathway, but not at TEAD.

Current Data Reported by SWMU—At only one SWMU did the HQs calculated for the kit fox for all three exposure pathways exceed 1: the HQ for iron via the soil ingestion pathway was 1.7 at SWMU 15.

Current Data Reported by ESA—HQs for six metals—aluminum, copper, iron, lead, selenium, and zinc—and dioxin/furans were above 1 for the kit fox dietary pathway. The metal HQs greater than 1 occurred at the RSA (maximum value for iron of 10.6; all other values less than 5). The HQs calculated for dioxin/furans were less than 1 at ESA-1, 13.7 at ESA-2, and 25.4 at the RSA. Soil ingestion pathway HQs over 1, all at the RSA, were for aluminum (HQ = 6), cobalt (HQ = 1.3), iron (HQ = 24), thallium (HQ = 7.6 based on NDs), and dioxin/furans (HQ = 3.4). In addition, an HQ of 1.6 was calculated for iron at ESA-1. All water pathway HQs were negligible.

7.4.1.1.10 ***Plants.*** Because there was only one exposure pathway (i.e., soil), the HQs for these receptors are essentially equivalent to the HQ_{EP}s, which appear in tables in the HI section (Section 7.4.2.1.10).

7.4.1.1.11 *Soil Fauna*. Because there was only one exposure pathway (i.e., soil), the HQs for these receptors are essentially equivalent to the HQ_{EP}s, which appear in tables in the HI section (Section 7.4.2.1.11).

7.4.2 Hazard Indices

Table 7-31 through 7-63 present the HIs *by location* for the terrestrial ecological receptors. In addition, HIs *by receptor* are provided in Tables 7-64 through 7-66 at the end of this section.

HIs for the receptors at the aquatic ecosystem (SWMU 14 Sewage Lagoons) are presented in Tables 7-81 and 7-82.

7.4.2.1 *Hazard Indices for Terrestrial Ecological Receptors*

HQs are the ratio of exposure to a toxicity criterion. HQs are therefore specific for each receptor, analyte, and exposure pathway. As a way of clarifying the risk assessment process, when the HQs were combined by pathway (i.e., HQ_{diet} + HQ_{soil} + $HQ_{surface\ water}$) and analyte group (i.e., DDT + DDE = DDT_R), they were called HQ_{EP}s. The HQ_{EP}s are summed to give one receptor-specific HI for each location.

7.4.2.1.1 ***Passerine Birds.*** **Historic Data**—Total HIs for passerine birds are shown in Table 7-31. SWMU total HIs exceeded the RSA HI (HI = 90) by a factor of two or more for SWMUs 1/1d, 8, 11, 14, 15, 21, 27, 42 and 47. Major contributors are the metals chromium, iron, lead, and thallium. As discussed in Section 7.6.4, thallium HQs for the RSA and ESA SWMUs are based on nondetects. Many historical SWMUs had no data for thallium and thus no thallium HQ value, which may reduce the value of the SWMU HI value relative to the RSA. The effect of deleting the RSA thallium HQ from the total RSA HI for comparison against historical HIs has been evaluated. The relative magnitude of the RSA HI/SWMU HI is reversed for some SWMUs. For example, Table 7-31 indicates that the RSA HI is higher than the SWMU value, but after subtracting the RSA thallium HQ, the SWMU value is higher than the RSA value. Those SWMUs which show this reversal due to thallium for passerines are 7, 28, 34, 35, 36, and 40.

Current Data Reported by SWMU—Total HIs for all exposure pathways for passerine birds ranged from 125 at the RSA to over 500 at SWMU 11 (Table 7-32). Major contributors to the HIs, in general, were cadmium, iron, thallium, and dioxin/furans. Specific contributors resulting in high HIs include lead for SWMU 11 (HI = 192), chromium at SWMU 45 (HI = 37), and zinc at SWMU 15 (HI = 44).

Current Data Reported by ESA—Total HIs for passerine birds are shown in Table 7-33. Total HIs for ESA-1 (HI = 202) and ESA-2 (HI = 274) are both larger than the total HI for the RSA (HI = 125). Common contributors for all cases are cadmium and thallium. Analyte

groups that especially impact the ESA-1 HI value are lead, chromium, phthalates, and barium. Similarly, dioxin/furans, lead, zinc, iron, and copper are the major contributors to the ESA-2 value.

7.4.2.1.2 ***American Kestrel.*** **Historic Data**— The total HIs calculated for SWMUs 1/1d (HI = 19.9), SWMU 15 (HI=2.4), and SWMU 42 (HI = 3.7) exceeded 1 as shown in Table 7-34 (RSA HI =5). Metals are the major contributors to the HIs. If, as discussed above for passerine birds, the thallium HQ value is subtracted from the RSA HI, then SWMUs 15 and 42 HIs would be greater than the RSA.

Current Data Reported by SWMU—Total HIs for the kestrel as shown in Table 7-35 were all less than the RSA value and all less than 10. The maximum value calculated was for SWMU 15 (HI = 9.4), with major contributors the dioxin/furans (HI = 3.6), copper (HI = 1.3), and zinc (HI = 1.7).

Current Data Reported by ESA—Analyte-specific HIs calculated for all pathways for the kestrel were all less than 10 as noted in Table 7-36. Total HIs were calculated as follows: RSA (HI = 13), ESA-1 (HI = 2.4), and ESA-2 (HI = 14). The major contributors to the HI are dioxin/furans and thallium; the dioxin/furan value for ESA-2 contributes over half of the total HI.

7.4.2.1.3 ***Great Horned Owl.*** **Historic Data**—As shown in Table 7-37, all of the total HIs for the great horned owl were less than the RSA (HI = 1.8) of which the thallium HQ of 1 was based on nondetects.

Current Data Reported by SWMU—All HQ_{EP} values were less than 1 for the great horned owl as shown in Table 7-38. The total HI calculated for the RSA was 4, with the maximum analyte-specific HQ_{EP}s resulting from thallium (HI = 1 based on nondetects) and lead (HI = 0.8).

Current Data Reported by ESA— Total HIs are less than 1 for the two ESAs. HIs for the TEAD ESAs were lower than the RSA value of 4.0 (Table 7-39).

7.4.2.1.4 ***Golden Eagle.*** **Historic Data**—All total HI values calculated for the golden eagle were negligible (<1), other than that for SWMU 1. The HI at SWMU 1 was 1.3; however, the RSA total HI was 4.1 (Table 7-40).

Current Data Reported by SWMU—HIs calculated for the golden eagle were all less than 1 except for the HI at the RSA (Table 7-41). The total HI for the RSA was 8.1, for which thallium contributed an HQ_{EP} of 2.5 based on nondetects.

Current Data Reported by ESA—As shown in Table 7-42, the HIs for ESA-1 were all very low. The ESA-2 total HI was just over 1, with dioxin/furans contributing over half of the total HI. The RSA total HI was 8.1, with thallium (a non-detect) contributing one-third of the total. Iron (HI = 1.1) and lead (HI = 1.2) are also contributors.

7.4.2.1.5 ***Bald Eagle.*** **Historic Data**—All total HI values for the bald eagle were negligible (<1), other than that for SWMU 1. The HI at SWMU 1 was 1.3; however, the RSA total HI value was 4.1 (Table 7-43).

Current Data Reported by SWMU—HIs for the bald eagle were all less than 1 except for the RSA (Table 7-44). The total HI for the RSA was 8.0, of which thallium contributed a value of 2.5 (based on NDs).

Current Data Reported by ESA—As shown in Table 7-45, the HIs for ESA-1 were all very low. The ESA-2 total HI was just over 1, with dioxin/furans contributing over half of the total HI. The RSA total HI was 8.0, with thallium (a non-detect) contributing one-third of the total. Iron and lead are also contributors.

7.4.2.1.6 ***Deer Mouse.*** **Historic Data** —Total HIs for deer mice are shown in Table 7-46. SWMU total HIs exceeded the RSA HI (HI = 28) by a factor of 5 for SWMUs 1, 11, 21, and 42. Major contributors to the HIs include 2,4,6-TNT, RDX, aluminum, barium, chromium, copper, iron, lead, and thallium.

Current Data Reported by SWMU—Total HIs for the deer mouse for all exposure pathways and analytes combined are shown in Table 7-47. The HI values were consistent between SWMUs and the RSA, except for SWMU 10. An HQ_{EP} value of 1,434 for the explosive RDX increased the HI at SWMU 10 by an order of magnitude.

Current Data Reported by ESA—The total HI for the RSA was 90 (Table 7-48). Explosives, dioxin/furans, and iron were the major contributors to this value. The ESA-1 total HI was also 90; however, barium, lead, and antimony HQ_{EP}s were relatively higher and dioxin/furans lower than at the RSA. The total HI for ESA-2 was 310, of which explosives contributed over half of the total.

7.4.2.1.7 ***Mule Deer.*** **Historic Data**—As shown in Table 7-49, only the total HIs calculated for SWMUs 1/1d (HI =16.7), SWMU 15 (HI = 1.3), and SWMU 42 (HI=3.8) exceeded 1 (RSA HI=3.5).

Current Data Reported by SWMU—As shown in Table 7-50, HIs calculated by SWMU for the mule deer are 5 or less. By comparison, the RSA HI was 12.7, of which explosives contribute an HQ_{EP} of over 5. The highest SWMU HQ_{EP} was 1.9 for iron at SWMU 15; this analyte is a nutrient.

Current Data Reported by ESA—As shown in Table 7-51, all HQ_{EP} values for ESA-1 were less than 1; however, the total HI was 3.3. Explosives contribute one-third of the total value. The total HI for ESA-2 was 32, of which RDX (HQ_{EP} = 23) was the major contributor. The total HI calculated for the RSA was 12.7, of which RDX (HQ_{EP} = 3.3), 2,4,6-TNT (HQ_{EP} = 2.2), and iron (HI = 2.9) were the major factors.

7.4.2.1.8 *Jackrabbit*. Historic Data—Total HIs for jackrabbits are shown in Table 7-52. SWMU total HIs exceeded the RSA HI (HI = 9.5) by approximately a factor of 4-5 for SWMUs 1/1d and 42. Major contributors include 2,4,6-TNT and RDX at SWMUs 1/1d, as well as aluminum, barium, copper, iron, lead, and thallium. As discussed in Section 7.4.2.1.1, if the RSA thallium HQ is subtracted from the RSA HI, the HI for SWMU 40 exceeds the RSA HI.

Current Data Reported by SWMU—Total HIs for jackrabbits were less than 6 for SWMUs 1b, 1c, 11, 12, 21, 37, and 45 (Table 7-53). However, the RSA total HI was 35, and largely influenced by explosives and iron. The HI at SWMU 1c was 16, again, because of explosives and iron. The SWMU 10 total HI was 52, of which the HQ_{EP} for RDX was over 51. The SWMU 15 total HI was 59, with PAHs and dioxin/furans contributing along with iron and explosives. A total HI of 30 was calculated for SWMU 42, of which lead contributed disproportionately along with iron and explosives.

Current Data Reported by ESA—The RSA and ESA-1 total HIs were both 35, although the HQ_{EP}s making up the total HI vary somewhat (Table 7-54). ESA-1 HQ_{EP}s for barium, lead, and antimony were higher than the RSA values, whereas the 2,4,6-TNT value was higher for the RSA. The ESA-2 total HI was considerably higher than the HI at either the RSA or ESA-1 (HI=196), with RDX, dioxin/furans, and iron being the major contributors.

7.4.2.1.9 *Kit Fox*. Historic Data—The total HI for the RSA for the kit fox was 44 as shown in Table 7-55. No HI values calculated for the SWMUs exceeded the RSA values.

Current Data Reported by SWMU—SWMU-based HIs for the kit fox were generally less than 5 as shown in Table 7-56. However, at SWMUs 15 and 42, the HIs were approximately 10 because of dioxin/furan compounds. The RSA total HI was 95, and the major contributors to the HI were aluminum, dioxin/furans, iron, lead, and thallium.

Current Data Reported by ESA—As shown in Table 7-57, total HIs for the ESAs were lower than that for the RSA (HI = 95). The major factor for ESA-2 was the HQ_{EP} for dioxin/furans. Dioxin/furans and iron were the major contributors to the RSA total HI.

7.4.2.1.10 *Plants*. Historic Data—Of the 37 SWMUs for which HIs were estimated for plants from the TEAD historic data, total HIs for 16 SWMUs were higher than those calculated for the RSA (HI = 41). Further, if the RSA thallium HQ is subtracted from the

RSA HI, the HIs for SWMUs 8, 20, 26, and 34 would be greater than the resultant RSA HI. Total HI values were as high as 2,000 for SWMU 21. The major factor for this high value and that at SWMU 22 (total HI = 1,555) was the HQ_{EP} for 2,4,6-TNT. The HQ_{EP}s for antimony at SWMU 42 and silver at SWMU 3 were the other high values noted for plants (Table 7-58).

Current Data Reported by SWMU—Total HIs for plants based upon the soil exposure pathway ranged between 30 and 65 (RSA HI = 41), except for SWMUs 15 and 42 (Table 7-59). The SWMU 15 HI value of 177 was influenced by large contributions from copper and PAHs, while antimony contributed approximately half of the SWMU 42 HI.

Current Data Reported by ESA—Total HIs for plants for the soil pathway were calculated as 41 for the RSA, 84 for ESA-1, and 72 for ESA-2 (Table 7-60). Aluminum, thallium, and vanadium were consistently high between the three areas. Antimony was a major contributor to the ESA-1 HI. PAHs, copper, and zinc were higher at ESA-2 than at the other areas.

7.4.2.1.11 ***Soil Fauna.*** **Historic Data**—Of the 37 SWMUs for which HIs were estimated for soil fauna from the TEAD historic data, HIs for 28 SWMUs were higher than those estimated for the RSA (HI = 45.5). The metals chromium, copper, iron, and lead were the major contributors to the totals. The maximum total HI value of 3,470 occurred at SWMU 21. The highest HQ_{EP} influencing the HI was the chromium value of 3,233 (Table 7-61).

Current Data Reported by SWMU—Total HIs for soil fauna based upon the soil exposure pathway ranged between 25 and 67 (RSA total HI = 45.5), except for SWMUs 11, 15, and 45 (Table 7-62). The total HI of 120 for SWMU 11 was influenced heavily by chromium and iron. PAHs contributed to the total HI for SWMU 15 in addition to chromium and iron. The total HI of 190 for SWMU 45 was largely made up of the HQ_{EP} for chromium.

Current Data Reported by ESA—Total HIs for soil fauna for the soil pathway were 46 for the RSA, 98 for ESA-1, and 87 for ESA-2 (Table 7-63). HQ_{EP} values for chromium and iron were the major contributors to the total HIs. The highest HQ_{EP} was 79 for chromium at ESA-1.

7.4.2.2 *Terrestrial Ecosystem Risk Drivers*

A COPC was deemed to be a risk driver if it produced HQ_{EP}s in excess of 1 for any exposure pathway regardless of the RSA value, and contributed at least 5 percent to the total HI for each receptor. The RSA HQ_{EP}s and HIs were used only for the sake of comparison to the TEAD risk values and were not subtracted from the TEAD HQ_{EP}s or HIs. Metals are the predominant COPCs driving ecological risk at TEAD for almost all receptors. At those SWMUs where there was the potential for unacceptable ecological risks listed in Section 7.7 (i.e., SWMUs 1/1d, 8, 10, 11, 12/15, 21, and 42), metals contributed the largest contribution to the total HIs for each receptor. In addition to metals, explosives and/or dioxins/furans were

risk drivers to a lesser extent, at several locations (i.e., SWMUs 1/1d, 10, 11, 21, and 42). PAHs presented a much lower contribution to total risk at SWMUs 11 and 12/15. Risk drivers are presented in Section 7.7, Risk Description, on a SWMU-by-SWMU basis.

7.4.2.3 *Impacts of Aluminum and Iron on the SWERA Hazard Indices*

Concentrations of aluminum and iron are predominantly due to the desert soil types present at TEAD (Section 5.12). The impacts of iron, primarily, and aluminum, secondarily, on the HIs should be considered when interpreting their contribution to the ecological risks. Iron distributions in soil at TEAD and the RSA were shown not to differ significantly (Table 5-43). Aluminum distributions were shown to differ significantly; however, both of these COPCs consistently produced similar HQs at both TEAD and the RSA for many receptors. Following discussion with the USEPA, it was agreed to address those COPCs in a semi-quantitative manner by including them in the risk calculations, and then in a qualitative manner by discussing their relative contributions to the overall HIs.

As shown in Table 7-67, iron and aluminum in soil contribute significant risk to the HIs for receptors at the SWMUs recommended for alternative action. Since these two COPCs have been designated as semi-quantitative due to their widespread distribution in soil and similar "inherent" risks based upon both the TEAD and RSA backgrounds, the resulting HIs should be qualified as such. Excluding SWMU 10, since iron and aluminum are not primary risk drivers at that location, noteworthy contributions to the HIs based on soil concentrations are as follows:

- SWMU 1/1d
  - 30% iron + aluminum (deer mouse, mule deer, jackrabbit, kit fox)
  - 7% iron (passerine birds)
  - 9% iron (American kestrel)
  - 16% iron + aluminum (soil fauna)
  - 5% aluminum (plants)

- SWMU 8
  - 42% iron (deer mouse)

- SWMU 11
  - 25% iron (passerine birds)
  - 50% iron (deer mouse, jackrabbit)
  - 40% iron (soil fauna)

- SWMUs 12/15
  - 21% iron (passerine birds)
  - 22% iron (American kestrel)
  - 80% iron (deer mouse, mule deer, jackrabbit, kit fox)

- SWMU 21
  - 11% iron (deer mouse)

- SWMU 42
  - 15% iron (deer mouse, jackrabbit)

Removal of the iron and aluminum contributions alone could reduce the risk to acceptable levels relative to the RSA for many of the receptors at these SWMUs. Iron and aluminum in soil contribute substantially to much of the ecological risk. For this reason, it seems reasonable to assess risk on COPCs other than these two metals in terms of potential remediation.

7.4.3 Weight-of-Evidence Analysis

A weight-of-evidence (WOE) analysis was developed as a tool to help assess the results of the SWERA and to aid in providing recommendations to the risk managers for possible remediation. No single factor was used to categorize risk at the TEAD SWMUs. Several factors were considered prior to categorizing a SWMU for ecological risk. The WOE for each receptor at each SWMU and the RSA was used in conjunction with the HIs and HQs and the biometric data as both a graphical and numerical means to help categorize risk. Thus, the WOE rating represented an additional line of evidence with which to evaluate ecological risk. For example, if the HIs and HQs at a SWMU were elevated relative to the RSA, and the WOE rating for the SWMU was higher than the WOE at the RSA, and if the biometric data at a SWMU indicated a potential for harmful effects relative to the RSA, then the site was considered to pose an unacceptable ecological risk. However, if the WOE was fairly constant between a site and the RSA for various receptors, less consideration was given to the WOE rating and more reliance was placed on the relative magnitude of the HQs and HIs. A categorization of "low ecological risk" became evident when a site's HQs and HIs were comparable to the RSA, and the WOE ratings for the site were comparable to those from the RSA. Further, sites that had high HQs and HIs (generally greater than 100) and high WOE were viewed as having a higher potential for ecological risk. Sites that had moderately high HQs and HIs and higher WOE ratings were typically categorized as "moderate risk". Sites that had several receptors with HQs and HIs greater than 5-10 times (5-10X) the RSA were also deemed to have unacceptable ecological risk and were generally categorized as "high ecological risk". For those historic SWMUs where no biometric data were collected and the dietary pathway was not calculated, the value of the WOE was more dependent on the numbers and types of samples collected at that location, the abiotic media analyte concentrations, and the TBVs, or lack thereof, for the various receptors. The WOE tables that illustrate the calculation of the WOE ratings are provided in Appendix I.

Seven categories were selected for use in deriving a total weight-of-evidence value based upon their contributions to the overall degree of confidence in the risk assessment conclusions. In order to simplify this process, each category was assumed to contribute equally to the total WOE or 1/7 (14.3 percent). The seven categories selected are as follows:

1. Analytical detection limits and TBVs—Were the analytical detection limits relative to the TBV sufficiently low so as to be protective of ecological receptors? If a TBV and detection limit combination was exceeded (Section 4.5.3.1)— that is, was *not* sufficiently protective (or did not "pass")—then a WOE value of -10 was applied for each receptor at each location. If no TBV was available for the particular analyte-receptor combination, a WOE value of 0 was applied. If the TBV-detection limit combination "passed", a WOE value of 10 was applied. In addition, if one or more matrices for an individual analyte failed to pass, then the entire analyte for the specific receptor did not pass. This category applied only to dietary ingestion of biota and is receptor-specific. The WOE will be higher at the ESA SWMUs and the RSA relative to TEAD historic SWMUs since the dietary ingestion pathway exists at those locations due to biota sampling.

2. Data quality/data type—Locations where there were more than one type of sample collected were assumed to carry a higher degree of confidence where only one or two data types were present. Due to the limited amount of surface water data, its relative level of importance was less than soil or biota. This category relates to location but not receptor. The WOE rankings were as follows:

   - HIGH—soil + biota + surface water : 250
   - MEDIUM—soil + biota : 200
   - MEDIUM-LOW—soil + surface water : 150
   - LOW—soil only : 100

3. Cterm values—Relates to the quality of Cterm data for dietary component calculations for receptors at the RSA and ESA SWMUs only. This WOE category is receptor- and location-dependent. The WOE rankings were as follows:

   - HIGH—measured data : 3
   - MEDIUM—modeled output data : 2
   - MEDIUM-LOW—extrapolated/hypothetical : 1
   - LOW—no data : 0

4. TBV studies—The more toxicity studies which supported a TBV indicated a stronger WOE. This was calculated on an analyte basis for each receptor. All analytes were summed to obtain a WOE_TBV value for each receptor. This category is receptor-dependent. The WOE rankings were as follows:

   - HIGH—greater than 3 studies : 3
   - MEDIUM—2 to 3 studies : 2
   - LOW—1 study : 1
   - NONE—no studies : 0

5. Uncertainty factors (UFs)—The more UFs applied to a TBV, the more uncertain the TBV; therefore, a lower WOE was assessed. This was calculated on an analyte basis for each

receptor. All analytes were summed to obtain a WOE_UF value for each receptor. This category is receptor-dependent. The WOE rankings were as follows:

- HIGH—total UFs less than 10 : 3
- MEDIUM—total UFs between 10 and 100 : 2
- LOW—total UFs greater than 100 but less than 500 : 1
- NONE—total UFs greater than 500 (qualitative) : 0

6. The number of samples (N) taken at a SWMU—N was deemed to directly affect the confidence in the risk assessment conclusions. N was restricted to soil (0-to-2-foot depths), biota, and surface water data. The greater the total N, the higher the WOE assessed. This category is location-dependent. The WOE rankings were as follows:

   - HIGH—greater than 50 samples : 300
   - MEDIUM—25 to 50 samples : 200
   - LOW—less than 25 samples : 100

7. Comparison of the TEAD final HIs to the final HIs at the RSA—Based upon the DQOs discussed in Section 2.1.3, the comparison would lend a greater WOE to the risk assessment conclusions if the TEAD HIs were greater than the RSA HIs for a given receptor. This is based on the presumption that TEAD is contaminated relative to the RSA. Category 7 is dependent on all categories. The WOE rankings were as follows:

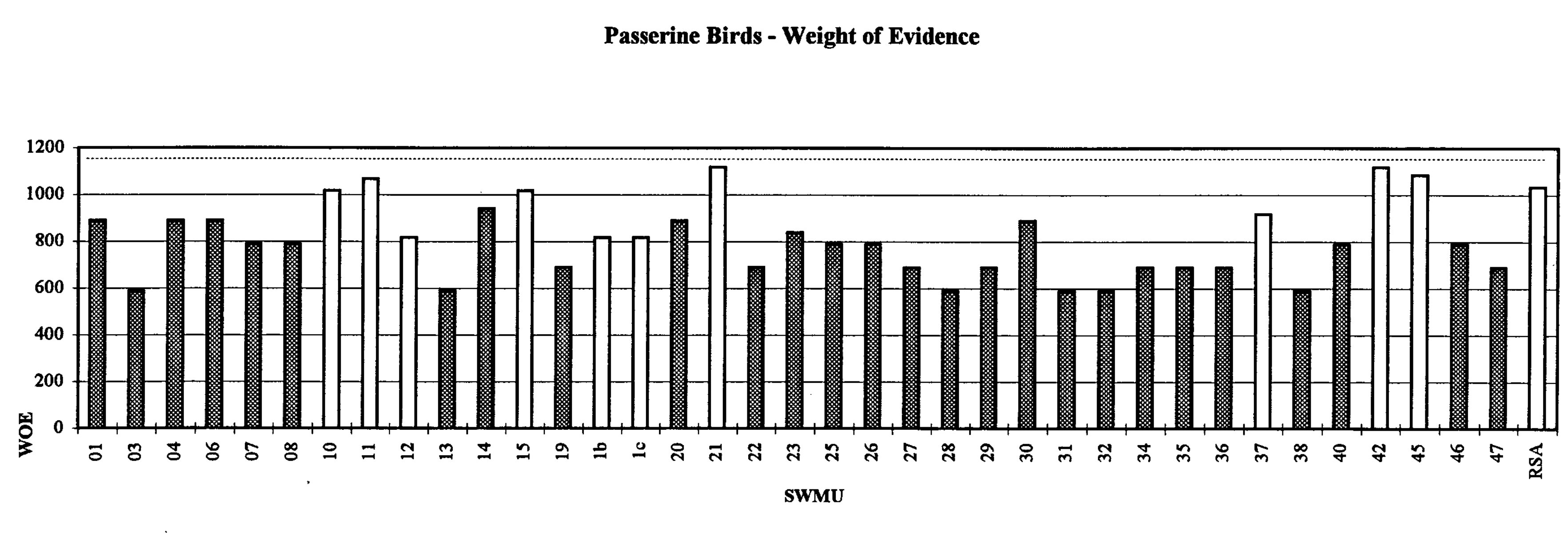
   - HIGH—TEAD HIs 10X ≥ RSA HIs : 200
   - MEDIUM—TEAD HIs > RSA HIs : 100
   - LOW—TEAD HIs ≤ RSA HIs : 0

The WOE tables in Appendix I present the total WOE values for each receptor at each location. The total WOE values for each receptor at each location are plotted for ease in interpretation and are shown in Figures 7-17 through 7-22.

As expected, the WOE is higher for ESA SWMUs than for other TEAD SWMUs because of the higher degree of confidence associated with the collection of the additional soil and biota samples at those locations. The availability of surface water data at SWMUs 11 and 45 slightly increased the WOE at those locations. The WOE approach supports the SWERA conclusions to a greater degree at ESA SWMUs; however, higher WOE at other locations (e.g., 1/1d) support the conclusion that this location poses ecological risk. Other SWMUs where the WOE is rather constant by receptor are primarily the result of fewer samples and only one sample type (i.e., soil and/or sediment).

7.4.4 Evaluation of Programmatic DQOs

At the conclusion of the study, it is necessary to examine whether the intent of the DQO process was fulfilled. That is, were sufficient data of appropriate quality collected in order to



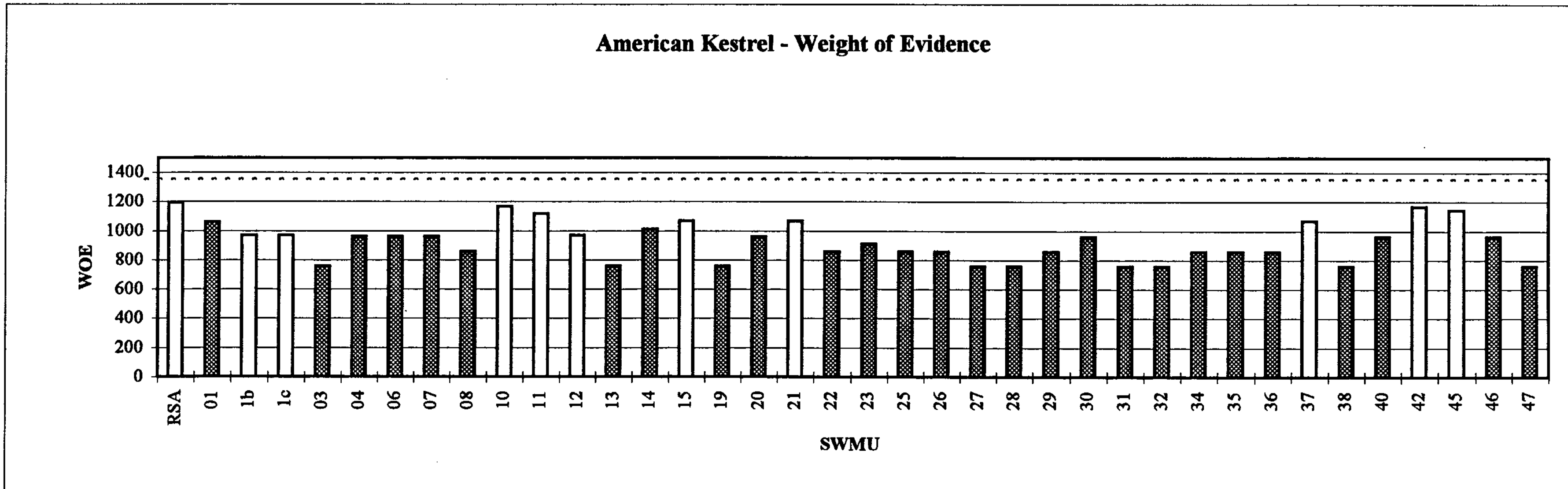
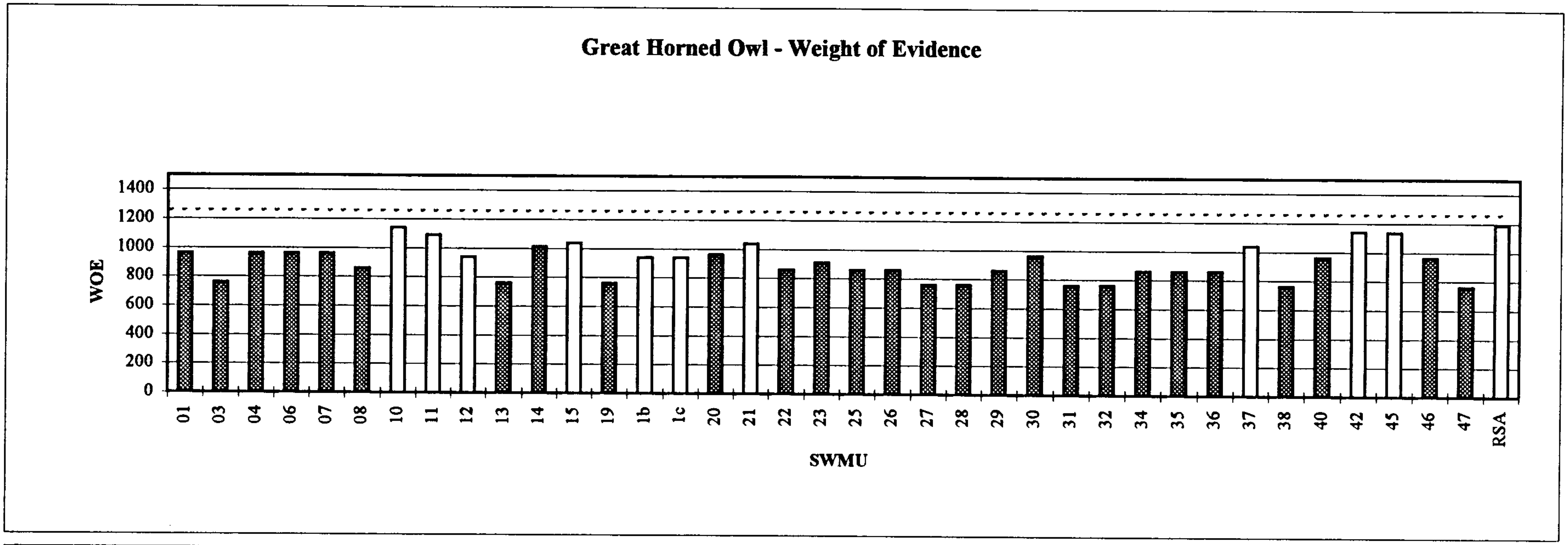


Figure 7-17. Weight of Evidence - Passerines and American Kestrel



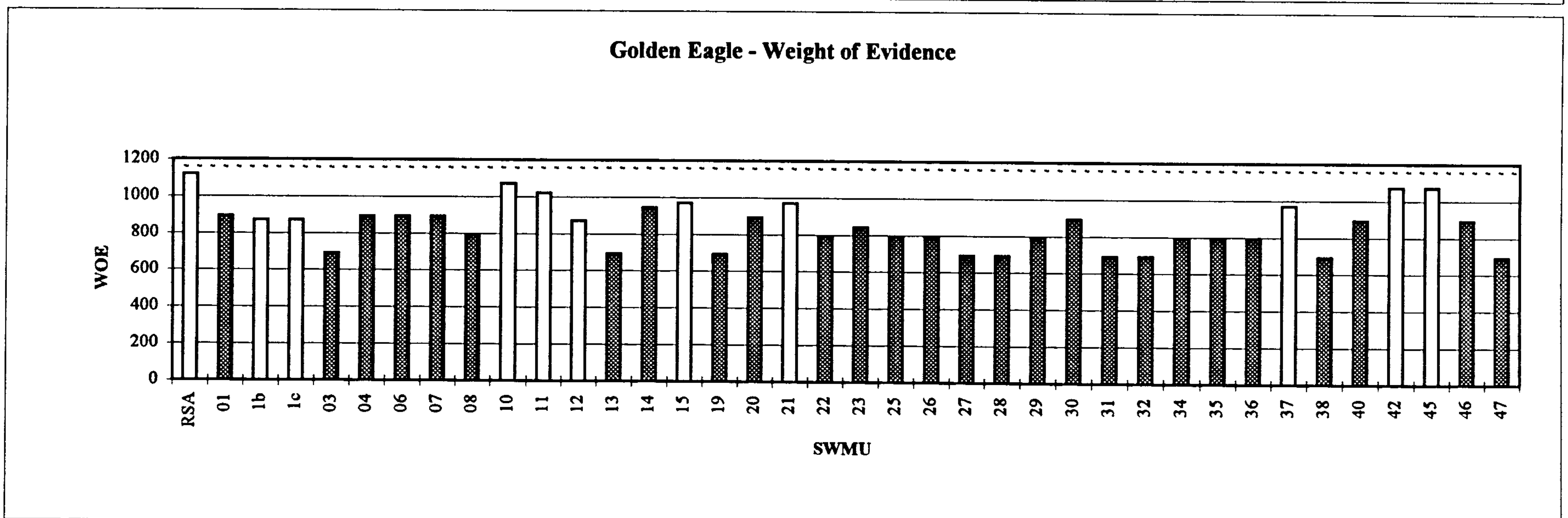
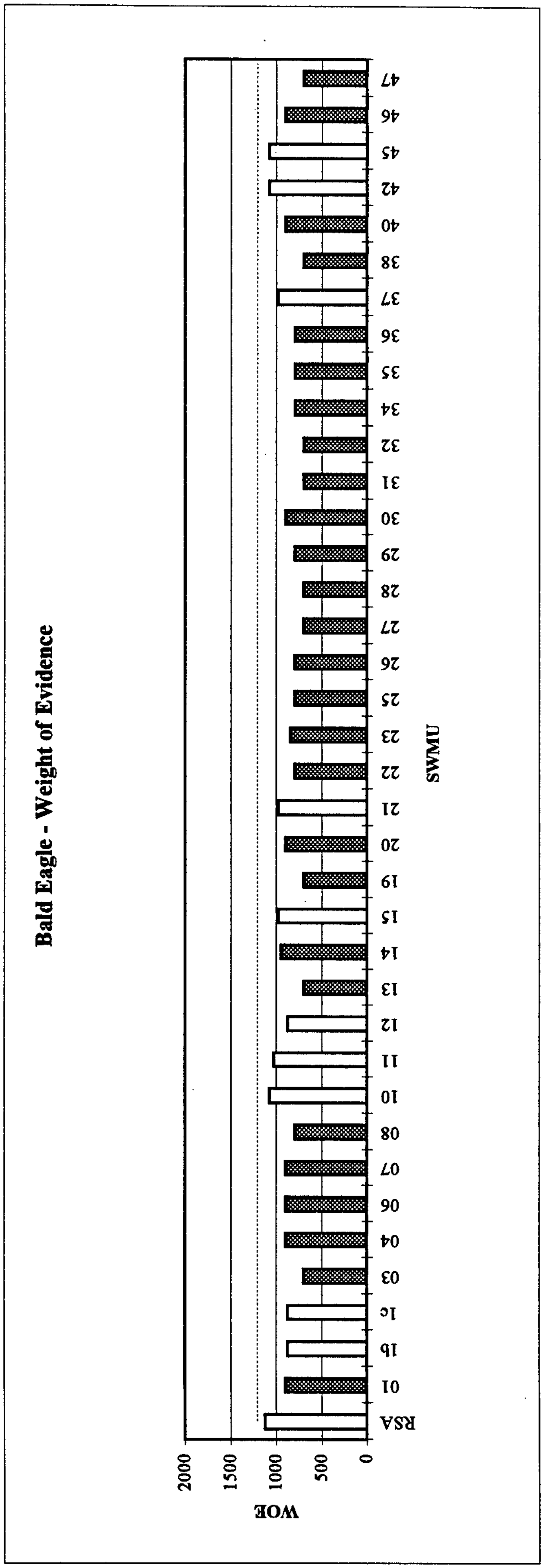


Figure 7-18. Weight of Evidence - Great Horned Owl and Golden Eagle



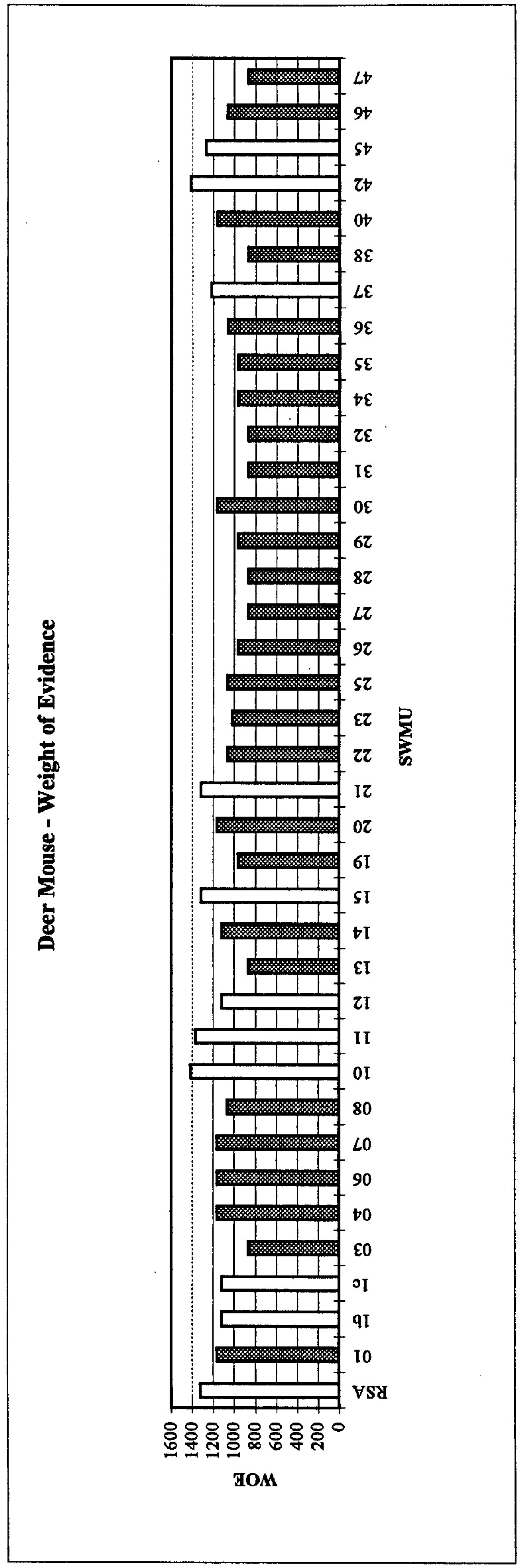
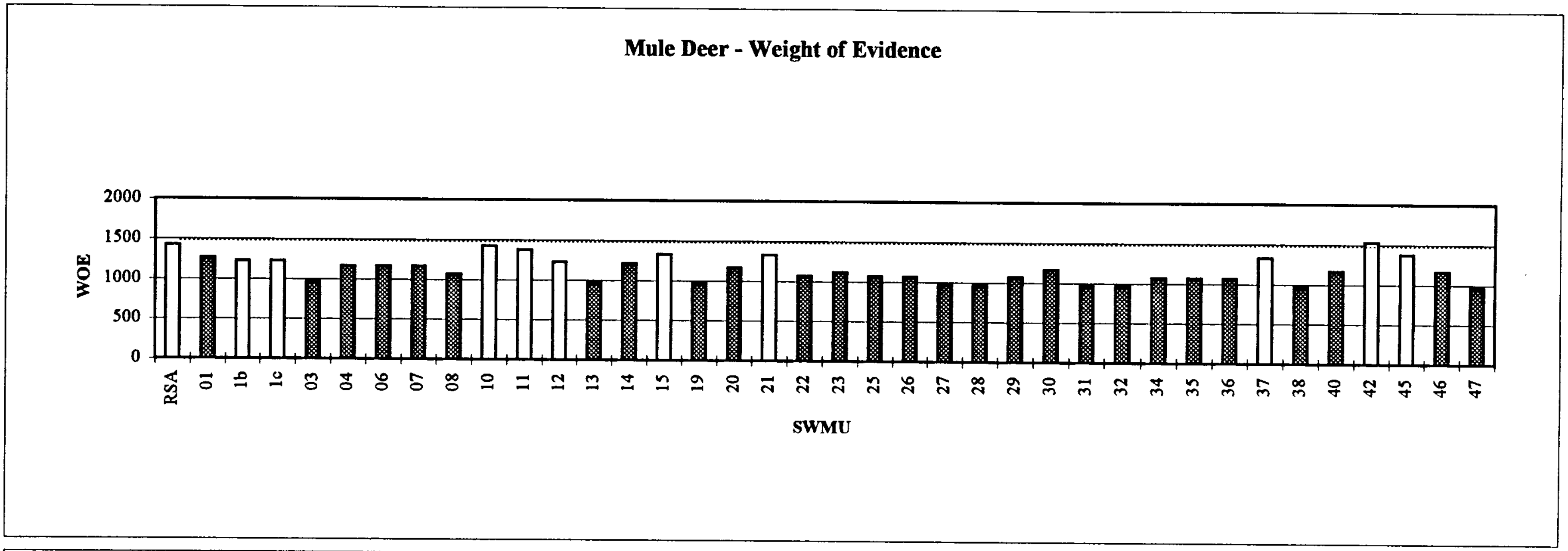


Figure 7-19. Weight of Evidence - Bald Eagle and Deer Mouse



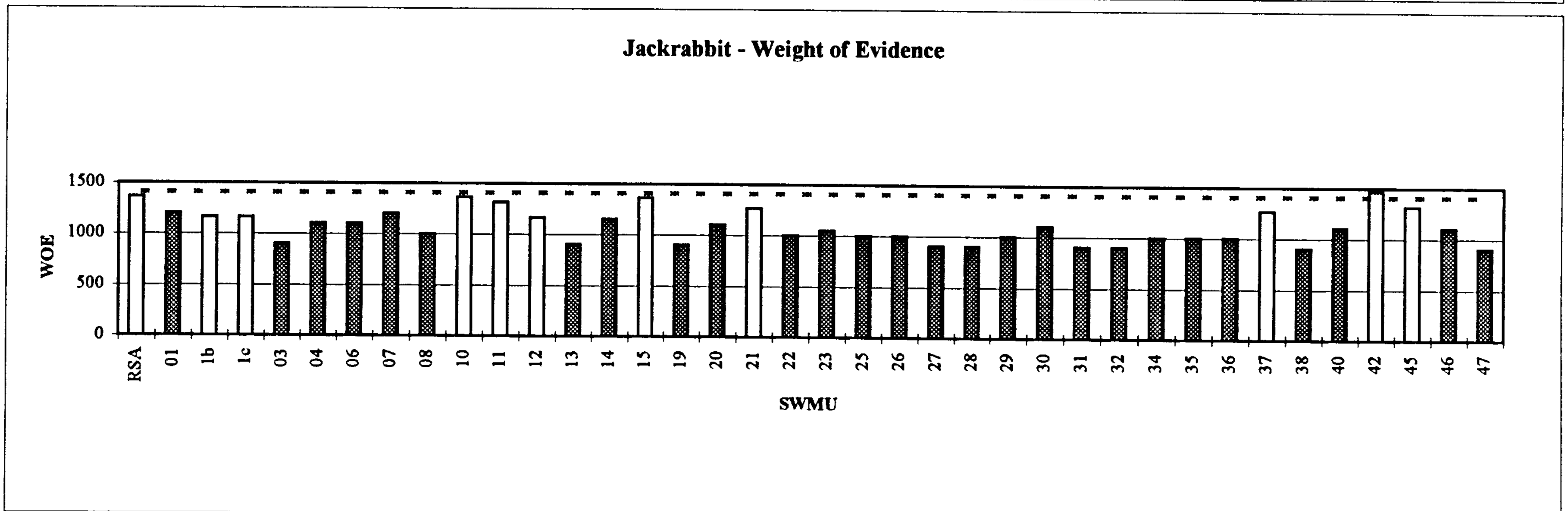
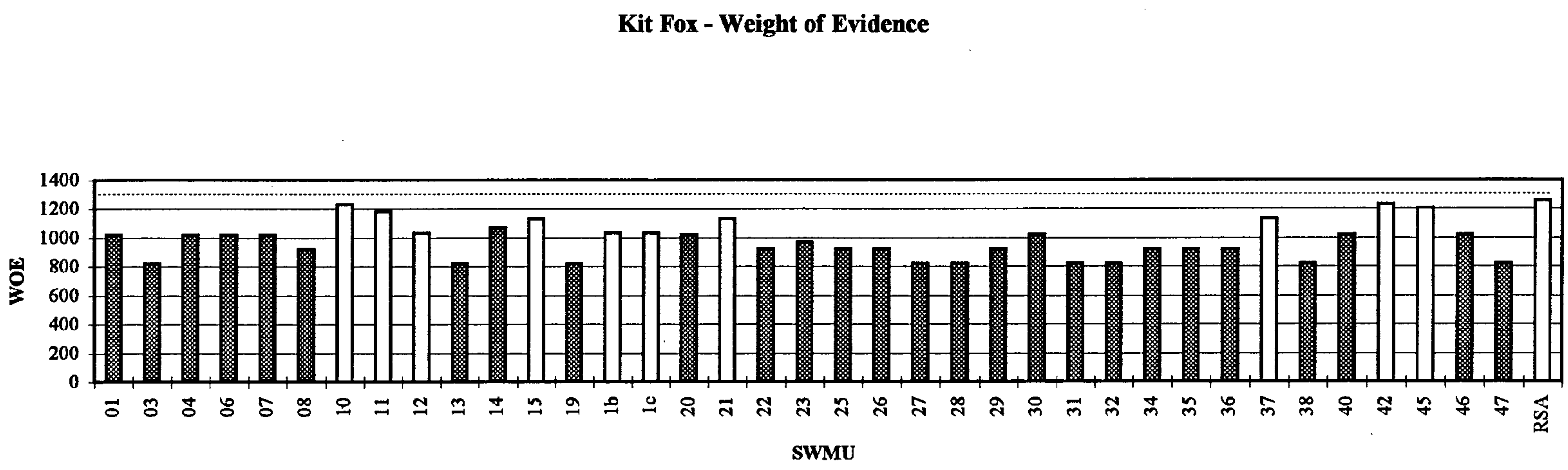


Figure 7-20. Weight of Evidence - Mule Deer and Jackrabbit



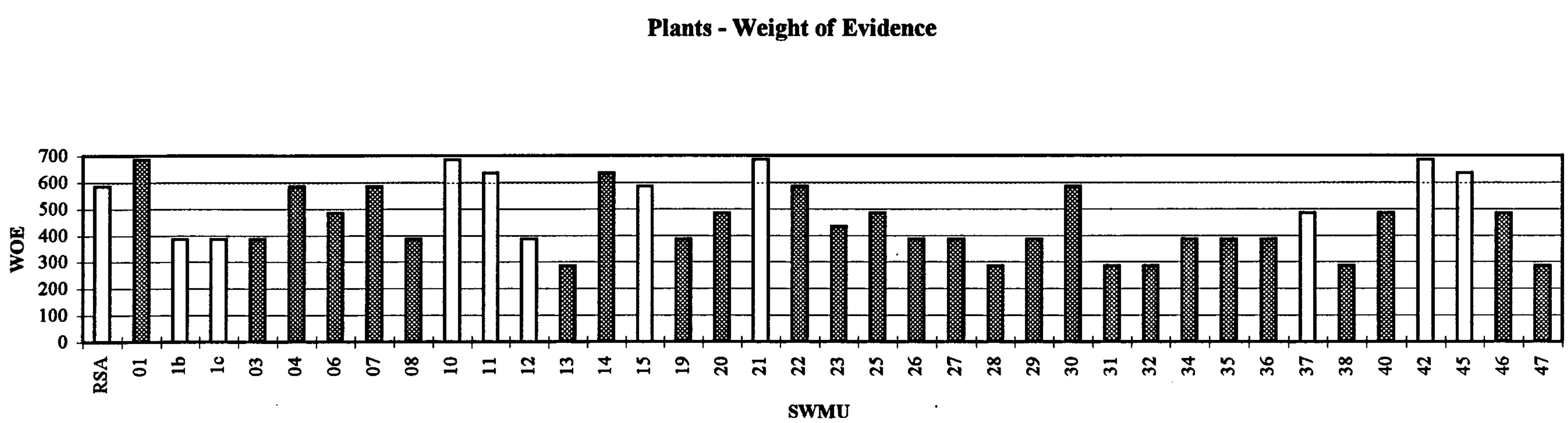


Figure 7-21. Weight of Evidence - Kit Fox and Plants

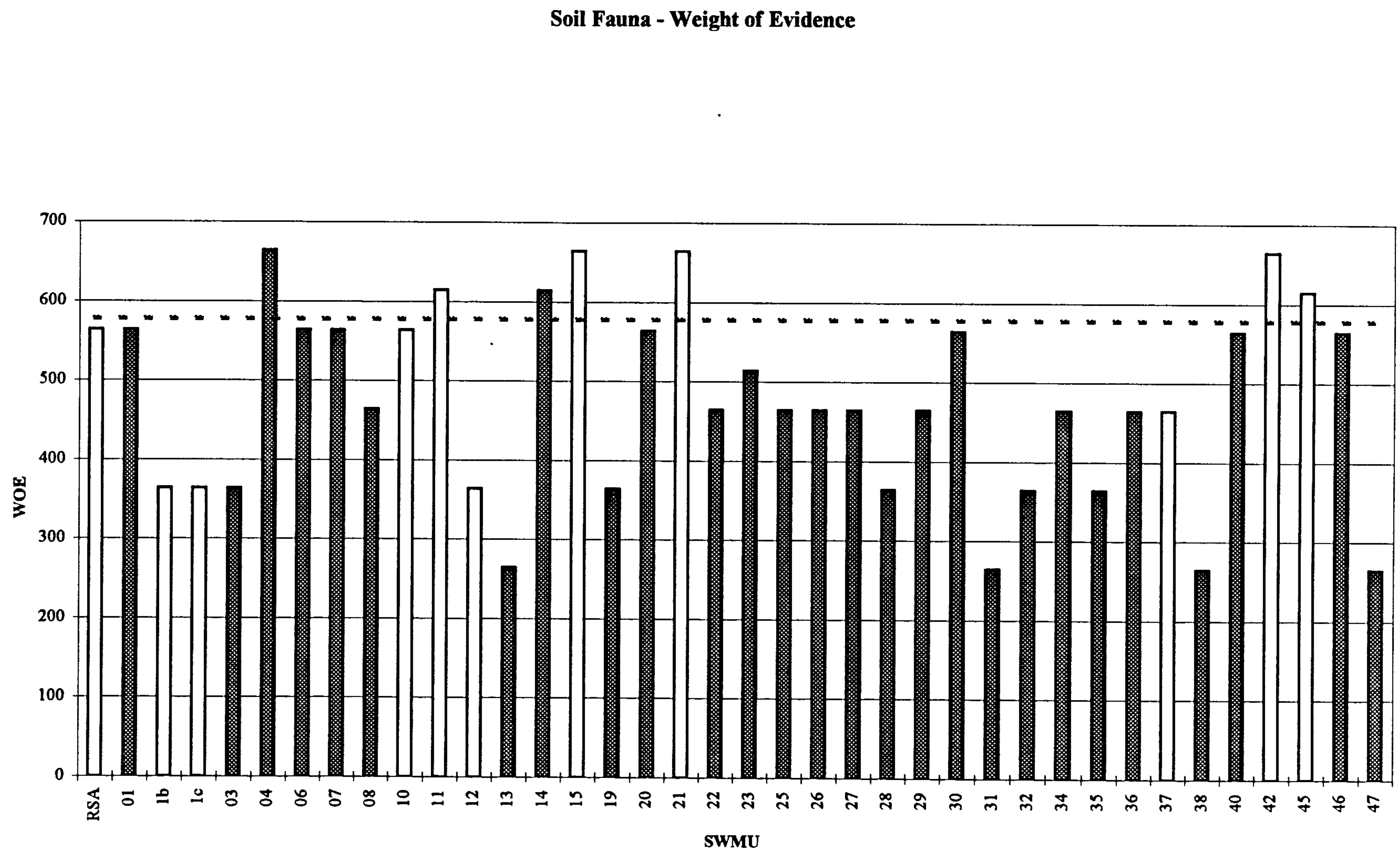


Figure 7-22. Weight of Evidence - Soil Fauna

determine whether site-related contamination poses an ecological risk at TEAD, or are more and different types of data required? And, when comparing the DQO process to the measurement and assessment endpoints, were the measurement endpoints protective of the assessment endpoints?

Although the DQO process is aimed primarily at determining the nature and extent of contamination at contaminated sites, and not primarily for ecological risk assessments where many different types of data may be gathered, it is worthwhile to evaluate and implement those areas of the process that are appropriate for ecological risk assessment purposes.

7.4.4.1 *Analytical and Biometric DQOs*

As to the evaluation of the analytical data quality, it is fairly straightforward to address the DQO process in terms of the PARCC parameters. The determination of adequate sample size was addressed in the preliminary planning phase and was explained in the SWEAP/QAPjP (Rust E&I 1994c). It was established through meetings and correspondence with the ETAG that this study is a baseline ERA representing only a snapshot in time and reflects a compromise among various constraints.

The analytical soil and biota data for this SWERA were evaluated against the PARCC parameters and were subjected to rigorous internal and external DQA. As such, for risk assessment purposes, the DQOs were deemed to have been met. As discussed in Section 4.5.3.2 (Soil Data Usability), the number of soil samples collected at the RSA for several analytes were inadequate to detect an MDRD of 40 percent; however, it should again be noted that the DQO guidance represents a *suggested* approach toward the collection of soil and water samples for characterization of nature and extent of contamination at CERCLA sites. By evaluating the PARCC parameters, the majority of the biota analytical data were likewise deemed to have met the DQOs (Section 4.5.3.5). Because of the biased nature of the biota sampling, an evaluation of required sample size for tissue analysis was not conducted. The number of soil and biota samples was agreed upon by the ETAG as the best compromise among programmatic schedules, budget, and goals.

When evaluating the biometric data obtained during the Fall 1994 sampling effort in terms of vegetation and small mammal population and distribution, the ability to discern future trends and draw conclusions from one season is somewhat limited. Based upon the available biometric data, an evaluation of the data usability in terms of required sample size was conducted for the small mammal and vegetation survey data (Section 7.6.2, Uncertainty Analysis). The results showed that the sample size for the small mammal trapping grids was adequate; however, for some species, the number of transects for the vegetation surveys did not achieve all statistical performance goals.

The DQO process was successful in enabling decisions to be made regarding the analytical detection limits. Even while incorporating large uncertainty factors into the final TBVs, the majority of the soil, surface water, and biota detection limits were lower than the TBVs

(Section 4.5.3.1); therefore, the potential for false negatives is low (i.e., the potential to miss risk that is actually present is low).

There appears to be some thallium contamination in soil at SWMUs 1/1d, 21, and 42, which may be linked to munitions. Other potential sources include rodenticides, pesticides, metal alloys, and products associated with semiconductor and photoelectric cell manufacturing. Thallium was also detected in sediment at SWMU 14 Sewage Lagoons (aquatic ecosystem risk assessment) and produced low HQs for the duckling and shorebird at that location. Specific sources of thallium have not been confirmed at TEAD. An evaluation of all of the soil, sediment, and surface water data from 0 to 2 feet indicated that various analytical methods for thallium were employed with a range of CRLs from 1 to 34 $\mu g/g$ for both graphite furnace and ICP analysis. Other thallium detections in soil, surface water, or sediment were eliminated as COPCs due to frequency of detection or comparison to background. Most of the thallium data collected for TEAD resulted in non-detects and were associated about equally with lower detection limits as well as higher detection limits. See also Sections 7.6.3 and 7.6.4.

Dioxins in soil are probable based upon their widespread distribution in biota at TEAD and the RSA. Dioxins are generally associated with burning of PCBs or creosote-based woods; however, their presence may be attributed to many other sources. Dioxin/furan sampling in the Phase II RI Addendum at SWMU 6 (Old Burn Area) confirmed low levels of dioxins and furans in several areas—some of which were suspected to contain them—as well as in on-site reference soil samples collected for comparison. As expected, higher levels of dioxins/furans were observed at depths associated with known burn horizons. Low concentrations of dioxins were observed in all of the surface soil samples collected for dioxins and furans at SWMU 6. Since dioxins and furans have been identified but are not widespread risk drivers at TEAD, the potential for false negatives appears low. Furthermore, biometric data collected for the SWERA show a strong relationship between variability in small mammal populations and human disturbance rather than effects due to widespread chemical contamination.

The overall intent of the DQO process is to design and execute a sampling and analysis plan that will provide the information necessary to the risk manager as to the potential for risk to ecological receptors. This plan includes analytical and biometric data collection, analysis, and evaluation. To this end, the DQOs of the SWERA have been met, in that, usable information has been obtained that has identified risks to specific ecological receptors at particular locations. In addition, the COPCs driving the risk have been identified. Those SWMUs posing unacceptable ecological risk have subsequently been identified for alternative action.

7.4.4.2 *Assessment and Measurement DQOs*

In order to evaluate whether the DQO process was successfully implemented in the SWERA, it is necessary to determine whether the measurement endpoints were protective of the assessment endpoints. The measurement and assessment endpoints table presented in Section 2.1.3 (see Table 2-1) has been modified and is included in Tables 7-68 through 7-72. These

tables present an evaluation of the measurement and assessment endpoints for TEAD ecological receptors.

The results of the DQO process as related to measurement and assessment endpoints may be further explained with respect to the probability of Type I and Type II errors. The probability of a Type I error (i.e., false positive) would occur when risk is found to be present when, in fact, it is not. This would be favorable from the view of protection of ecological assessment endpoints. That is, to find risk when it is not really risk, is conservative; however, it may lead to unnecessary cleanup and subsequent loss of habitat. To err on the opposite side would be failing to detect risk when it is actually present (i.e, false negative, Type II error). Since the SWERA has calculated risks at SWMUs associated with high COPC concentrations and which also have been identified as human health concern areas, the potential for false negatives is low. Determination of risk, when it is present, is protective of the assessment endpoints, in that risk has been determined, and alternative action, in the form of remediation, is likely and would, upon cleanup, prevent harm to ecological receptors. When compared to the risk assessment results based on soil and biota analyses, the biometric data are in close agreement. The number of SWMUs which have the potential for unacceptable ecological risks are few (i.e., SWMUs 1/1d, 8, 10, 11, 12/15, 21, and 42). These risk results correspond to the results from the biometric data in that physical disturbance accounts for most of the ecological effects at TEAD while effects due to chemical contamination are low.

The summary of conclusions which can be reached through the measurement and assessment endpoints are provided below:

Endpoint #1—*Protection of mammals, avian species, and Special Status Species from adverse effects due to elevated concentrations of COPCs in forage/prey species.*

Assessment endpoint is protected since measurement endpoints identified potential risk in biota to receptors at SWMUs where biota were collected. Biometric data do not indicate that chemical contamination is a significant factor associated with small mammal density, and detrimental population effects do not appear likely (Table 7-68). Transect data provide a strong association with human disturbance and plant species associated with grazing and earth-moving activities.

Endpoint #2—*Protection of mammals, avian species, and Special Status Species from adverse effects due to elevated concentrations of COPCs in surface soils, or due to loss of forage/prey species as a result of elevated soil concentrations.*

Assessment endpoint is protected since measurement endpoints identified potential risk in soil to receptors at SWMUs where soil and/or sediment data were collected. Biometric data at the ESA SWMUs do not indicate that chemical contamination is a significant factor associated with small mammal density, and detrimental population effects do not appear likely (Table 7-69). Transect data and regression analysis provide a strong association with human disturbance and plant species associated with grazing and earth-moving activities. Therefore,

although the HQs indicate potentially high levels of risk at some locations, there is no evidence that from a functional basis, single, large populations on a site-wide basis are being affected.

The sampling for chemical analysis was intended to be biased towards visually impacted areas that may actually be avoided by ecological receptors, as opposed to the selection and location of small mammal grids and vegetation transects (biometric data) that are more representative of site-wide population success. The biometric data were randomly collected at each ESA SWMU over a large SWMU area. Co-located soil and vegetation samples were focused on small, rather localized areas of known contamination.

Endpoint #3—*Protection of mammals, avian species, and Special Status Species from adverse effects due to elevated concentrations of COPCs in surface water.*

Assessment endpoint is protected since measurement endpoint did not reveal risk due to surface water ingestion to receptors at SWMUs where surface water data were collected. The amount of surface water data is limited to only a few locations, and thus, this pathway is overly conservative (Table 7-70).

Endpoints #4 and 5—*Protection of waterfowl and waders from adverse effects due to elevated concentrations of COPCs in sediment or surface water at the SWMU 14 Sewage Lagoons. Protection of waterfowl and waders from adverse effects due to elevated concentrations of COPCs in forage/prey at SWMU 14 Sewage Lagoons.*

Assessment endpoints are protected since some minimal risk was identified to the shorebird and duckling at the Sewage Lagoons (SWMU 14). Exposure point concentrations were overly conservative, thereby providing an even greater degree of receptor protection (Table 7-71).

Endpoint #6—*Protection of the Bald Eagle ingesting waterfowl containing elevated concentrations of COPCs at the SWMU 14 Sewage Lagoons.*

Assessment endpoint is protected since no risk was identified to golden or bald eagles (special status species) feeding on waterfowl at SWMU 14. Although golden eagles have been observed at TEAD, none have been observed feeding at the Sewage Lagoons. Jackrabbits and small mammals are the most likely components of their diet (Table 7-72).

7.5 AQUATIC ECOSYSTEM RISK ASSESSMENT

7.5.1 Problem Formulation

The problem formulation section reviews the existing data for the SWMU 14 Sewage Lagoons and derives pertinent assessment and measurement endpoints. The data available include water and sediment analytical data for a large suite of analytes (Montgomery Watson 1992; SAIC 1994). In addition, biological data were collected during Fall 1994 sampling activities, which document the types of benthic invertebrates occurring in the sediments at SWMU 14. Several

scoop samples were collected from the sludge covering the bottom of SWMU 14. The samples contained very few invertebrate species. Cladocerans and dipterans dominated the aquatic community. There also were several mollusks, trichopterans, hemipterans, and nematodes collected.

SWMU 14 contains two raw sewage lagoons, which have received inputs from many areas of the depot. Currently, an active pond of 7.4 acres exists within the fenced area of SWMU 14. The fenced area covers approximately 20 acres. A dry pond has provided spill-over capacity during periods of heavy use. SWMU 14 is the only major open water resource in this area of TEAD and, therefore, is likely to be an important wildlife resource. Waterfowl and shorebirds were observed utilizing the area for feeding and resting. Mallards were a common type of waterfowl. While eagles have not been observed feeding or roosting at SWMU 14, there is the potential for them to occur at SWMU 14. Ospreys have been observed in the area, but the lack of fish precludes extensive foraging by this species.

This section of the SWERA addresses potential risk to avian receptors utilizing the SWMU 14 pond for staging, feeding, and drinking. It is assumed that the 8-foot-high fence prevents mule deer and other large mammals from entering the area. It is also assumed that if no risk is observed for waterfowl or shorebirds (both of which have high water and sediment ingestion rates) or for raptors, other avian species with lower exposure rates utilizing the area will be protected. Small mammals such as deer mice may utilize the area around SWMU 14 but are not expected to ingest sediments or surface water to any great extent because most desert-dwelling small mammals obtain their daily water needs as a component of dietary ingestion. Avian species that feed in riparian or wetland habitats, such as shorebirds, are expected to be more at risk than mammals because of their high potential for exposure.

The aquatic ecosystem risk assessment contains problem formulation, exposure analysis, toxicity assessment, and risk characterization. The exposure analysis predicts exposure due to direct ingestion of abiotic media on a daily basis. In addition, dietary ingestion is predicted with a food web model. The food web model assumes that chemicals are at equilibrium and provides estimates of tissue concentrations based upon current measured data. The assessment endpoints for SWMU 14 include the following:

- Protection of waterfowl and shorebird populations feeding or drinking at SWMU 14
- Protection of bald eagles or other raptors feeding on waterfowl at SWMU 14 or drinking from the pond
- Protection of migratory bird populations drinking water from SWMU 14

The measurement endpoints to address these concerns are concentrations of COPCs in surface water and sediment. The HQs and HIs were obtained from the surface water and sediment data available for SWMU 14 and the TBVs for avian species. The analytical data were used in the exposure assessment to predict daily intakes and tissue concentrations. The intakes (mg/kg bw/day) were then compared to TBVs from the toxicity assessment in order to obtain HQs and HIs.

7.5.2 Exposure Analysis

The exposure analysis estimates exposure point concentrations, daily exposure intakes (or doses), and tissue concentrations in invertebrates and avian species. All toxic analytes detected in surface water and sediment were evaluated as COPCs. Antimony and cyanide were below detection in surface water and sediment; therefore, exposure and risk estimates were not made for these two analytes. Magnesium, calcium, sulfate, sodium, and potassium are generally considered nontoxic and were not evaluated further. Nitrate anion was also not evaluated quantitatively in the report.

7.5.2.1 *SWMU 14 Exposure Point Concentrations*

Summary statistics are reported for the lagoon surface water and sediment data collected by SAIC during the 1994 field season and are presented in Table 7-73. Table 7-74 presents the surface water data, and Table 7-75 presents the sediment data collected by Montgomery Watson in 1992. The two sets of data were evaluated separately in order to obtain two independent sets of risk assessment conclusions; barring any analytical or sampling errors, the conclusions should be the same. The maximum concentrations were used as exposure point concentrations to screen the data for potential adverse effects.

Acetone was not evaluated in the risk assessment as this is likely a common laboratory contaminant (USEPA 1989b), and it was detected only once in the current data. Chloroform, another common laboratory contaminant, was also detected only once in surface water in the historical data (Montgomery Watson 1992) and was not evaluated quantitatively. PAHs and other organics were detected at low concentrations in surface water and sediment. Anions and chemicals generally considered nontoxic, or those chemicals that were below detection limits in both sediment and surface water, were not quantitatively evaluated. The chemicals that were evaluated quantitatively are found in Tables 7-76 through 7-79.

7.5.2.2 *Exposure Intakes Due to Ingestion of Abiotic Media*

An exposure intake (or dose) is the amount of a chemical ingested per unit of body weight on a daily basis. Exposure intakes are dependent on media ingestion rates. Media ingestion rates were obtained from several sources. Water ingestion rates were based on mallard duck and red-tailed hawk data (USEPA 1993a; Preston and Beane 1993). Soil and sediment ingestion rates were expressed as a fraction of daily dietary ingestion. The dietary ingestion rates for mallard ducks, mallard ducklings, and shorebirds were estimated from allometric equations for seabirds (USEPA 1993a). Dietary ingestion rates for red-tailed hawks were available (Preston and Beane 1993; USEPA 1993a) and used to represent all raptors potentially feeding in the area.

Sediment dietary ingestion rates were obtained from data in Beyer et al. (1994). The fraction of soil or sediment in the diet for the Canada goose (8.2 percent) was used to reflect the

waterfowl fraction of sediment in diet. An average ingestion rate for several sandpipers was used to represent sediment ingestion by shorebirds (Beyer et al. 1994). The following exposure pathways based on abiotic media ingestion were addressed:

1. Sediment → adult waterfowl, duckling, or shorebird
2. Water → adult waterfowl, duckling, shorebird, or raptor

Raptors were assumed to not ingest sediments from SWMU 14 because they are unlikely to spend time foraging in the mud along the shore. Even if sediment ingestion was estimated for raptors, the estimated fraction in the diet is much lower than that of waterfowl or shorebirds; thus, exposure and risk due to this pathway would be less for raptors than for shorebirds or waterfowl.

Exposure intakes were calculated for waterfowl and shorebirds ingesting sediment and surface water from the site, and for raptors ingesting surface water from the site. The parameters used to estimate intakes are summarized for both SAIC and Montgomery Watson data in Tables 7-76 through 7-79.

The general equation for calculation of intakes is:

(Equation 7-31)

$$Intake = Media\ ingestion\ rate * Media\ Concentration * AUF * CF$$

where

Intake	=	mg chemical/kg bw/day
Media ingestion rate	=	kg sediment/kg bw/day, or liter water/kg bw/day
Media concentration	=	mg/kg (sediments), μg/liter (water)
AUF	=	area use factor (unitless)
CF	=	correction factor (10^{-3} for water and dietary intakes)

In order to obtain the avian ingestion rate for sediment, the dietary ingestion rate (kg diet/kg bw/day) was multiplied by the fraction of sediment or soil in the diet.

7.5.2.3 *Exposure Intakes Due to Ingestion of Biotic Media*

Exposure intakes (or doses) were calculated for raptors, waterfowl, and shorebirds for ingestion of dietary media. The following exposure pathway based on biotic media ingestion was addressed:

Sediment → water→ benthic invertebrates → waterfowl, shorebirds → raptor

As a conservative assumption, the mammal component was removed from the raptor diet. This is because waterfowl and shorebirds contact more sediments and water than would

jackrabbits, in addition to obtaining their diet from SWMU 14. Exposure intakes of biotic media are based on modeled tissue concentrations. Because analytical tissue data were unavailable, the chemical concentration in invertebrates was estimated using the following equation (Fordham and Reagan 1991):

(Equation 7-32)

$$C_{INV}=BCF*C_{H2O}*CF$$

where

C_{INV}	=	concentration in invertebrate (mg/kg)
C_{H2O}	=	concentration in water (μg/L)
BCF	=	bioconcentration factor (L/kg)
CF	=	correction factor of 1×10^{-3}

This equation assumes that the invertebrates are at steady state with their environment. The BCF was multiplied by the water concentration to obtain an invertebrate tissue concentration. When the water concentration was below detection, a value of 1/2 the CRL was used to estimate exposure point concentrations in water. The concentration in invertebrates provides the basis of dietary ingestion for adult waterfowl, ducklings, and shorebirds. Tissue concentrations in waterfowl are the result of uptake from diet, water, and sediment ingestion. Waterfowl tissue concentrations provide the basis for dietary ingestion by raptors.

The concentration in waterfowl tissue was estimated because data were unavailable. Concentrations in waterfowl were used to predict dietary ingestion rates by bald eagles or other raptors and were estimated by equations modified from Fordham and Reagan (1991).

(Equation 7-33)

$$C_{dk} = \frac{Af*R}{K_{EL}}*BCF_{INV} * AUF * C_{H20} \text{ x } CF + Uptake_{w} + Uptake_{sed}$$

where

C_{dk}	=	concentration in waterfowl (mg/kg)
Af	=	assimilation efficiency (unitless)
K_{EL}	=	loss rate (day^{-1})
R	=	dietary ingestion rate (kg diet/kg bw/day)
BCF_{INV}	=	bioconcentration factor for invertebrate prey (L/kg)
AUF	=	area use factor (unitless)
C_{H2O}	=	concentration in water (μg/L)
$Uptake_w$	=	uptake from water
$Uptake_{sed}$	=	uptake from sediment
CF	=	correction factor of 1×10^{-3}

While bioconcentration factors for invertebrates may be obtained from the literature (Appendix I), steady state bioconcentration factors for waterfowl are found infrequently. Therefore, chemical uptake from water or sediment was estimated by multiplying ingestion rate for sediment or water by the concentration in sediment or water, the AUF, *Af*, and finally dividing by K_{EL}:

(Equation 7-34)

$$Uptake_W = \frac{(\, Water\ Ing * C_{H2O} * AUF * Af \times CF)}{K_{EL}}$$

(Equation 7-35)

$$Uptake_{sed} = \frac{(Diet * Sediment\ Fraction * C_{sed} * AUF * Af\,)}{K_{EL}}$$

where

Water Ing	=	water ingestion rate (L/kg bw/day)
Diet	=	dietary ingestion rate (kg/kg bw/day)
CF	=	correction factor of $1x10^{-3}$
AUF	=	area use factor (unitless)
Af	=	assimilation efficiency (unitless)
K_{EL}	=	loss rate (day^{-1})

Water and sediment ingestion rates, as well as AUFs, were species- or taxon-specific. The other parameters (K_{EL}, *Af*, or concentration) were chemical-specific, but data are lacking to address these parameters as species-specific. Table 7-80 presents the media intake rates. The physicochemical constants that drive the chemical kinetics in tissue are presented in Appendix I.

An AUF was applied to the intake estimates for adult raptors and waterfowl to reflect that SWMU 14 does not provide 100 percent of the home range for many of the taxa evaluated. Because of this, other areas are used for feeding and drinking, in essence diluting the exposure from SWMU 14. The AUF used for raptors was 0.02 (USEPA 1993a; Preston and Beane 1993); the AUF for adult waterfowl and shorebirds was 0.036 (USEPA 1993a). The AUF used for ducklings and juvenile shorebirds was 1 as these receptors may be restricted to SWMU 14. Because of the low density of benthic invertebrates and other dietary items preferred by waterfowl, it is unlikely that all of foraging would occur within SWMU 14 except by ducklings and shorebirds. The home range of mallards is approximately 111 acres, which is very large relative to the area of the full lagoon at SWMU 14 (7.4 acres). Table 7-80

presents the taxon-specific exposure parameters used to assess the uptake and transfer of contaminants in the aquatic ecosystem.

Tables 7-76 through 7-79 present the exposure intakes based on exposure to abiotic media and the food web model described above. Intakes for the eagle or other raptors were much lower than for waterfowl, ducklings, and shorebirds. Shorebirds had the highest chemical intakes because of higher sediment, water, and dietary ingestion rates and an absence of an AUF. Intakes were based on maximum detected surface water and sediment because of a low number of samples; therefore, intake estimates are conservative representations of chemical exposure.

7.5.3 Aquatic Ecosystem Risk Characterization

The risk characterization contains a qualitative uncertainty analysis, sensitivity analysis for the model, HQs, and HIs. The toxicity values cited were presented in Section 7.3 of this report.

7.5.3.1 *Hazard Quotients/Hazard Indices*

HQs were calculated using the following equation:

$$HQ = Exposure\ Intake \div TBV \qquad \text{(Equation 7-36)}$$

where

Exposure Intake	=	mg/kg bw/day
TBV	=	toxicity benchmark value (mg/kg bw/day)

When the HQ exceeds a value of 1, some element of ecological risk is assumed. When the exposure intakes (or doses) are lower than the acceptable or "safe" intake, the TBV, ecological risk is considered minimal or nonexistent, and the resulting HQ is less than 1. HQs between 1 and 5 are likely to be within the bounds of uncertainty for the assessment. HQs in excess of 10 may present an actual risk and bear further consideration. Tables 7-81 and 7-82 present the HQs and HIs for avian receptors exposed to SWMU 14 source media. When TBV values were lacking, quantitative analysis could not be performed.

There were no HQs in excess of 1 for adult waterfowl or raptors (Tables 7-81 and 7-82) based on exposure at SWMU 14. However, there were some HQs in excess of 1 for ducklings and shorebirds, which had higher exposure rates. Cadmium, chromium, iron, lead, selenium, and thallium resulted in HQs greater than 1 for ducklings (Tables 7-81 and 7-82). Except for chromium, the HQs that exceeded 1 were less than 5. The duckling chromium HQ was 8.8.

Many analytes resulted in HQs above 1 for shorebirds (Tables 7-81 and 7-82). Cadmium, chromium, copper, iron, lead, selenium, silver, thallium, and zinc produced HQs ranging

from greater than 1 to nearly 20. Cadmium and chromium produced the highest HQs for shorebirds.

HIs were calculated by summing the individual HQs for each receptor. The magnitude of the HIs for the aquatic risk assessment based on data from both SAIC and Montgomery Watson were well below 1 for the duck and eagle. The data were analyzed separately since they were collected about 2 years apart. HIs for the duckling and shorebird were approximately 20 and 60, respectively, for both data sets; however, the risk drivers were somewhat different between the two data sets. There was generally excellent agreement in the magnitude of risk predicted for the two data sets.

The risk drivers that resulted in an HQ greater than 1 are summarized in Table 7-102 in the Risk Description, Section 7.7.

7.6 UNCERTAINTY ANALYSIS

All of the data used in the risk characterization contain some measure of error or variability. In addition, the assumptions used to simplify the overall process may also introduce uncertainty into the risk assessment results. This analysis identifies the major sources of uncertainty in the SWERA for both the terrestrial and aquatic ecosystems at TEAD.

The uncertainty analysis qualitatively addresses the primary sources of uncertainty identified for the risk assessment. These sources include, but are not limited to the following:

- Sampling process and analytical methodology
- Selection of ecological receptors
- Exposure parameters
- Bioavailability and contaminant uptake
- Contaminant interactions
- Location variability
- TBVs

7.6.1 Conservative Assumptions Used in the SWERA

Table 7-83 provides a summary of the conservative assumptions used in the SWERA. The result of these assumptions is that risk is overestimated and thereby protective of ecological receptors. Inherent in this process is the large degree of uncertainty in an ecological risk assessment, which can produce conflicting results. For this reason, unless the TEAD HIs relative to the RSA were significantly higher than the RSA HIs by more than approximately three times, the TEAD HIs were presumed to be within an acceptable margin of error for the process. It should be noted that the uncertainty in the TBVs associated with soil fauna is high since most of those values were derived from earthworm studies. Most plant toxicity studies are conducted on vegetation that would not survive in the desert environment. Due to the

physicochemical differences (i.e., high clay content, high native mineral content) in arid desert soils at TEAD compared to soils from wetter climates, as well as species differences, higher HIs to plant receptors were deemed not to pose an unacceptable risk. As a result, the risk conclusions were not based on plants and soil fauna HIs but, rather, on avian and mammalian risks.

By evaluating the TEAD ESA SWMUs and the RSA separately from the TEAD historic SWMUs in accordance with the null hypothesis (Section 2.1.3.6), the SWERA was able to compare the current co-located soil and biota data sets collected at the ESA SWMUS and the RSA without background subtraction or elimination of analytes based on detection frequency. This was meant to be conservative and reduce the potential for false negatives. Refer to Appendix I for COPCs with detection frequency =0 and HQs ≥1, and which were considered risk drivers. In addition, the potential for false negatives—or failing to find risk when it is actually present—was reduced by selecting the greater HIs from either the TEAD historic or TEAD ESA SWMUs and then arriving at a conclusion that unacceptable risks are possible. The reason for this approach was to ensure that the Type II errors would be minimized since the total number of samples collected at each SWMU represented a compromise between cost and statistical power and confidence.

7.6.2 Biometric Data - Uncertainty in the Evaluation of Vegetation Field Surveys and Small Mammal Trapping Data

Table 7-84 presents the results of the statistical evaluation of the biometric data (i.e., the small mammal trapping and vegetation transects). The Kolmogorov-Smirnov (KS) test was used to evaluate normality. In addition, each distribution was qualitatively compared to the normal curve. The vegetation data and small mammal density data (expressed as number of small mammals per unit area) did not differ significantly from normality at the 95 percent significance level; therefore, no transformations of the raw data were performed. There was one small mammal trapping grid per location (i.e., a sample size of one); therefore, "within-location" variability cannot be determined for the small mammal data. The vegetation data had a sample size of five (i.e., five transects per location), which allows for "within-location" variability to be considered as part of the location characterization. The small mammal data are sufficient to meet statistical performance goals since the small mammal data constituted 75 trap nights from each location; this amount of data provided a sufficient number of data points for several statistical analyses. The vegetation data (i.e., relative abundance expressed as a proportion) were highly variable, and statistical performance goals were not attained for some species. The field survey data do not bias the risk assessment in either direction as they were used qualitatively to support decisions made with the quantitative risk assessment.

7.6.3 Soil and Biota Analytical Data Uncertainty

There is always some uncertainty in any analytical methodology. Soil samples were collected and analyzed from all TEAD SWMUs (except SWMUs 39, 43, and 44), and although the suite

of analytes varied between programs in the historical data set, the number and types of samples are assumed to adequately characterize the nature and extent of contamination. Uncertainty exists in the data acquired during different sampling events with different contractors, sampling methodologies, and analytical methodologies. However, sampling variability typically contributes more to the total error than analytical variability. The uncertainty in the analytical data from the co-located soil sampling event is considered to be low since the data were collected and analyzed in a very narrow time frame and the DQA results indicated high data quality.

Biotic samples were collected at 10 ESA SWMUs, and, where necessary, the biota tissue concentrations were substituted, for selected analytes, at the other ESA SWMUs where analytical data for the dietary ingestion pathway were unavailable. This substitution increases the uncertainty in the conclusions based strictly on the dietary pathway. Conclusions based on the HQs for soil exposure are more certain.

Although MS/MSDs and duplicate analyses were not conducted in invertebrate tissues due to insufficient sample material, the uncertainty associated with the lack of these data is low. MS/MSD analyses are most useful for determining differences in complex matrices such as soil, sludge, and waste streams. The matrix, chitin, which composes the exoskeleton of most invertebrates, typically does not present an interference in reliable analytical methods. The reproducibility of the MDL study replicate analyses and the fact that the analytical laboratories indicated no matrix interference problems, indicate that matrix interferences in invertebrate tissue do not present a significant analytical problem. The lack of duplicate analyses does not contribute a significant increase in the uncertainty of the biota data since high variability of concentrations in living tissue are to be expected in nature. The biota laboratories addressed uncertainty in the analytical methods by analyzing laboratory control samples (LCS) for all biota methods, as well as laboratory MS/MSDs and duplicates for all but the invertebrate samples.

Stringent data quality review and quality control also lend confidence to the analytical data. In addition, comparison of MDLs to toxicity benchmark values (1) helps to ensure that detection limits were adequate in order to be ecotoxicologically relevant and (2) identifies those contaminants for which adequate detection limits were not attainable. Where greater than 50 to 70 percent of the samples were nondetects for any given analyte, any risk estimates are considered to be uncertain and probably overly conservative because the chance of frequent contact by receptors is so low. Matrix interferences in some of the biota analytical methods can produce uncertainty in the measurement process.

The source of thallium in TEAD soils is unknown. As discussed above in Section 7.4.4.1, several possible sources are identified. Thallium concentrations may be naturally elevated in the TEAD area. It is also possible that past Army activities at TEAD have resulted in thallium contamination. Thallium HQs as a source of uncertainty are also discussed below in Section 7.6.6.1.

Dioxins/furans represent another source of uncertainty and possible data gap. The analysis of dioxins/furans in biota revealed that low levels are fairly common in many matrices, while soil analysis revealed few detects. It was identified in Section 4.5.1.5 that this was primarily attributable to the differences between SW-846 Method 8280 and SW-846 Method 8290. As previously mentioned under the dioxin/furan discussion in Section 7.2.2.4.1, the higher detection limits for dioxins/furans in soil associated with Method 8280 limited the application of that bioaccumulation model as seen by the negative model fit values (Section 7.2.2.4.2). High MDLs can hamper the risk assessment process by failing to detect contamination when it is actually present (i.e., false negatives). This is frequently the result of matrix interferences; however, the detections of explosives in gumweed and rabbitbrush, though complicated by higher MDLs, were corroborated by corresponding detections in soil.

Thus, the potential for false negatives was evaluated in the sampling and analysis component of the risk assessment and found to be acceptably low. The impact of potential false negatives was discussed previously in greater detail in Sections 7.4.4.1, 7.4.4.2, and below in Section 7.6.4. The WOE as described in Section 7.4.3, also addresses the issue of the usability of data obtained under varying circumstances. The uncertainties associated with the analytical sampling and analysis components of the SWERA should be considered the lowest of all of the risk assessment factors. Uncertainty in the biota analytical data is not expected to bias the risk assessment in either direction. The use of 1/2 the detection limit is expected to adequately represent nondetects.

7.6.4 Uncertainty in Sampling Process and Analytical Methodology

There is uncertainty in any sampling methodology. Use of numerous jackrabbits at each of the sampling locations, multiple types of plant and invertebrate samples, and multiple transects for the biometric vegetation data help reduce uncertainty in the sampling process and analytical data. Extensive laboratory QC samples associated with the analytical methods also help to reduce uncertainty in the data. High MDLs associated with some analytical methods and matrix interferences may result in nondetects (i.e., false negatives). However, use of 1/2 the detection limit for nondetects in calculating the Cterms helps to minimize the likelihood of underestimating risk since the 1/2 the detection limit is also high. Furthermore, even with the additional UFs incorporated in the final TBVs, the majority of the TBV-detection-limit comparisons were sufficiently low as to be protective of ecological receptors (Section 4.5.3.1). This fact also helps to minimize the likelihood of underestimating risks.

As discussed in Section 7.6.3 above, the uncertainty due to thallium in TEAD soils may be associated with a potential data gap. Most TEAD soils were analyzed for thallium by inductive coupled plasma (ICP) analysis rather than the more sensitive graphite furnace atomic absorption (GFAA) method. During the later stages of the RI and RFI investigations, the GFAA analysis for thallium became the preferred method. However, as noted in Section 7.4.4.1, most of the soil samples collected and analyzed for thallium site-wide resulted in

nondetects. All thallium HQs associated with the *current, co-located* soil data collected at the RSA and ESA SWMUs were associated with non-detects. These samples were analyzed by the less sensitive ICP method. The calculated HQs, which result from the use of the nondetects, are generally high and represent an uncertainty in overall risk analysis, particularly with regard to the RSA.

The source of lead in jackrabbit also presents a degree of uncertainty. As discussed earlier in the discussion on lead model results (Section 7.2.2.4), lead may have sources other than the lead shot used for sample collection. Because the lead levels were elevated in the jackrabbits from both TEAD and the RSA, lead in jackrabbit tissue was analyzed by ICP spectroscopy rather than the more sensitive GFAA method. However, the lead in jackrabbit tissue values measured by ICP were approved by both the laboratory and data validators. In spite of the uncertainty in the sampling methodology by using lead shot, lead was shown not to bioaccumulate in the TEAD environment (i.e., the BAFs were less than 1). Refer to Appendix I for the chart showing lead BAFs in soil and biota. If the source of lead is truly lead shot, risk estimates for predators of jackrabbits are overestimated. If the lead is due to environmental exposure, risks are not biased in either direction.

An intentionally biased method was used to select co-located ESA soil sampling locations as discussed above and in Section 3.3.1. The possibility exists that the highest contaminant levels were not found in the SWERA sampling round because earlier historic sampling did not find the areas of highest contamination, and/or because the SWERA sampling did not exactly reproduce the earlier sampling locations. This biased sampling design is likely to result in overestimates, not underestimates, of risk. There may be some uncertainty in the fact that the majority of the current data were collected in the fall of 1994, whereas the terrestrial invertebrate data collection was postponed until the fall of 1995. Since the same sampling personnel and analytical laboratories were used, this uncertainty is expected to be minimal and should not produce bias in the risk assessment results.

7.6.5 Uncertainty Due to the Selection of Ecological Receptors

Redundancy enters the risk assessment process because animals of similar size may have similar ingestion rates and, therefore, comparable chemical intakes (or doses). Hence, a subset of receptors was selected that presumably was representative of all other species at TEAD. The plant and animal receptors chosen for chemical analysis were commonly occurring on TEAD and the RSA; therefore, they were likely to serve as food sources for other species. The receptors in the assessment also included burrowing mammals, which are likely to be highly exposed due to their high contact rate with soils. Raptors were also key species because these taxa are at the top of the food chain and are susceptible to bioaccumulative toxicants. Reducing the list of species at TEAD to a subset of key receptors for the risk assessment introduces uncertainty because it is unknown whether or not the

appropriate taxa were selected in order to address risk. This could potentially bias the risk assessment in either direction, or not produce any bias.

7.6.5.1 *Relevance of TEAD Ecological Receptors to Special Status Species*

Several mammalian and avian receptors were chosen as indicator species to represent the potential risks to all species at TEAD, including those of special status. The selection of this subset of species from which to perform quantitative risk assessment is necessary due to the amount of time, effort, data, and data manipulation required to address risks for each receptor species. By selecting species that are most likely to have high rates of contact with site-related contaminated media, most potential risks will be identified and there is assurance that Special Status species will be protected. However, when using the indicator species to represent risks to all ecological receptors, the following uncertainties should be considered:

- Whether the indicator species are representative of the Special Status species by virtue of similarities in natural history, behavior, feeding guild, taxonomy, or physiology.

- Risks to Special Status species are significant or relevant at the individual level as opposed to the population level.

- If any of the Special Status species have higher rates of contact than the indicator species, risks may be underestimated.

- If the Special Status species have highly specific critical-habitat requirements, they may not occur within contaminated, disturbed habitats; thus, risk is overestimated since the exposure pathways are incomplete.

- Risks may be predicted by the indicator species; however, there may be more devastating risks to Special Status species due to remediation efforts, and these potential effects of physical habitat disturbance to remove chemical contamination should be carefully weighed in the Feasibility Study (FS) and/or Corrective Measures Study (CMS).

While some of the receptors are species-specific, some of the receptors are broad taxonomic categories intended to represent all species in the group (i.e., passerines, plants, and soil fauna). The use of broad categories assumes that by (1) evaluating toxicological data for any species in the category and selecting the most conservative study, (2) applying uncertainty factors to obtain a NOAEL, and (3) using a 95th percentile for exposure parameters for several species in the category, all species in the category will be adequately protected. The combination of these three assumptions produces a conservative estimate that is probably protective even at the individual level. The approach used in this SWERA for terrestrial avian receptors, by necessity—due to the large number of sites, COPCs, and receptors—included simplifying assumptions of this nature as discussed in Section 7.2.2.5.5.

The TEAD area has been extensively used throughout current history for military, industrial, and agricultural purposes. While this does not preclude the presence of Special Status plant species, it does make their occurrence seem remote. Although no Special Status plants have been found at TEAD, Table 1-6 lists those that may potentially occur. Surveys should be conducted at each location for which remediation is proposed to ensure that habitat of Special Status species is not disturbed.

The mammalian receptors evaluated in the TEAD risk assessment were the mule deer, kit fox, jackrabbit, and deer mouse. The avian receptors included raptors (golden eagle, bald eagle, great horned owl, American kestrel) and passerine birds. Plants and soil fauna were also receptors. Table 7-85 evaluates whether or not the receptors selected are adequate for representing risk to Special Status species. Two of the receptors quantitatively addressed in the risk assessment—the golden eagle and bald eagle—are species of Special Status. These species are adequately represented, and predicted risks are conservative as additional uncertainty factors were used to reduce the TBVs.

Use of the generic category "passerine birds"—as it applies to overall uncertainty in the risk assessment and especially to Special Status species passerine birds—contains uncertainty in that the risks to specific avian receptors such as avian insectivores, avian granivores, and avian carnivores are not addressed individually.

All nonraptorial birds were evaluated as passerine birds in one group. Dietary preferences were divided between plants (33 percent), invertebrates (33 percent), and vertebrates (33 percent). Dietary ingestion for any given species may be skewed either high or low depending on the food habits of the species relative to the generic passerine bird. The pharmacokinetics of the COPCs in each biotic media also affect exposure estimates. This approach is adequate for representing any Special Status passerine bird species (i.e., Yellow-breasted chat, Willow flycatcher, and Common yellowthroat) since all such species are migratory and unlikely to be found in the dry-land habitat present at TEAD. Food preferences for the nonmigrants will change seasonally and annually, making any quantitative estimates of uncertainty labor intensive. In general, dietary risks due to dioxins, pesticides, and inorganics will be adequately addressed for all feeding guilds because these analytes were measured in tissues of plants and animals. Risks due to munitions may be underestimated for avian herbivores as munitions could be present in plants but not in animals.

In desert ecosystems, there is a shift in community structure toward omnivory relative to temperate communities (van der Valk 1997). Mammals are about 40 times more abundant than birds in terms of biomass or density. Many of the bird species that inhabit deserts are migratory (van der Valk 1997), which limits exposure seasonally, and the communities are dominated by carnivorous and insectivorous species (Wiens 1991). Given this information, any intakes based on multiple dietary items are assumed to be adequate for addressing passerine species likely to exist at TEAD. There are numerous risk estimates for avian carnivores, and the generic passerine bird represents all other feeding guilds likely to occur at TEAD. Of the species where dietary habits were reviewed, only a few seemed to be strictly

herbivorous or insectivorous. Most of the avian species or families reviewed are omnivorous and consume a variety of food items, for example:

- Spotted Towhee–seeds, invertebrates, vertebrates (lizards, snakes)
- Chipping Sparrow–seeds, insects
- Vesper Sparrow–seeds, insects
- Savannah Sparrow–seeds, insects, spiders
- Brown-headed Cowbird–seeds, insects
- House Finch–seeds, fruits, flower buds
- Lesser Goldfinch–seeds, fruits, flower buds
- Flycatchers–predominantly insects, some species also eat berries and seeds
- Shrikes–insects, birds, mammals
- Vireos–insects, spiders, lizards, snails, berries, fruits, seeds
- Jays–insects, other invertebrates, seeds, nestling birds, amphibians, fruit

Due to the concern of USEPA Region VIII that risk assessment was not performed for every unique passerine bird feeding guild, a Monte Carlo simulation to address this source of uncertainty was conducted. The simulation and results are discussed separately in Section 7.6.11. In response to further regulatory concerns, Rust E&I explained that due to the large number of COPCs at TEAD, any overestimations or underestimations of risk would likely be averaged over the dietary pathway. In conjunction with the Monte Carlo simulation, USEPA Region VIII acknowledged this explanation (September 1997) as being satisfactory to address their concerns.

Although no longer a Special Status species, the kit fox adequately represents risks to other canids and also to the procyonid ringtail (Table 7-85). The dietary preferences of the two species overlap, as ringtails consume small mammals, birds, lizards, invertebrates, vegetation (e.g., juniper berries, cacti), and fruits (Fitzgerald et al. 1994). The kit fox risk estimates should be protective of the Special Status bats, which forage 5 meters and higher above ground, and so would be expected to have lower to nonexistent soil ingestion rates. The TBVs for the kit fox incorporated additional UFs to account for Special Status species since initially the kit fox was listed. This is expected to overestimate risks to the kit fox.

The selection of the deer mouse to represent all small mammals is adequate since this species is common and omnivorous. Concern over the possible presence of Utah state sensitive species (SD), such as the Wyoming pocket mouse, may be relevant at those sites with elevated HIs for deer mouse and habitat suitable for pocket mice.

The deer mouse is more satisfactory for representation of potential risks to the Special Status Wyoming pocket mouse than is the jackrabbit (Table 7-85). The jackrabbit has a wide home range and, therefore, the exposure is lower than that of the Wyoming pocket mouse. The deer mouse is more similar in size, taxonomy, and behavior. Deer mice will live in burrows, as do pocket mice. Dietary preferences and home ranges are also similar. Therefore, risks to deer mice should be adequately representative of Wyoming pocket mice without consideration of additional uncertainty factors.

Four raptors were evaluated (Table 7-85). The large raptors (bald eagle, golden eagle, great horned owl) have a wide home range; therefore, predicting risks to smaller raptors may underestimate risks. However, evaluation of the American kestrel, a species with a small

home range, should be adequate to protect all other species of Special Status raptors (e.g., burrowing owl and short-eared owl) at TEAD without consideration of additional uncertainty factors for special status. The kestrel has the lowest body weight of the raptors (Johnsgard 1990); thus, allometric exposure parameters such as dietary ingestion rate will be higher and, thus, overestimate exposure parameters for the larger raptors. The American kestrel risk estimates should also be protective of the predatory passerine, the loggerhead shrike.

Although the great horned owl is not a Special Status species, risks associated with this receptor could also be extrapolated to the short-eared owl and the burrowing owl, both of which are Utah state sensitive (SP) species because of taxonomic similarity. The risks to the great horned owl are also representative of the other raptors.

For the other terrestrial receptors, including the golden eagle, bald eagle, mule deer, kit fox, and jackrabbit, the selection of these receptors for the SWERA was highly relevant because (1) all but the kit fox are known to inhabit or visit the facility and (2) suitable habitat exists. Therefore, these receptors are directly representative of the TEAD ecosystem. In addition, the selection of the golden eagle and the bald eagle, which are Special Status species, provides an even greater degree of protection.

The use of a generic "plants" receptor to represent all TEAD plant species is another simplifying assumption. Although habitat may exist at TEAD for Special Status plant species, none were identified during the site survey (June 1993). This represents a source of uncertainty since the survey was limited, and some species may have been overlooked.

The choice of ecological receptors at the aquatic ecosystem (SWMU 14 Sewage Lagoons) is highly relevant in that the mallard duck and duckling and various shorebirds are typical visitors at that location. Although the bald eagle has not been observed feeding at the Sewage Lagoons, the intent was to be protective of other strictly carnivorous raptors such as the American kestrel, golden eagle, and great horned owl. A degree of uncertainty lies in the selection of a "generic" shorebird to represent all other shorebirds; however, the RME exposure scenario utilizing the 95th percentile exposure parameters for this receptor as the basis of the estimate is conservative.

7.6.6 Toxicity Data Uncertainty

There is uncertainty in the toxicity values used to represent the TBVs. In general, the TBV was the lowest of the NOAELs obtained from the ecotoxicology literature. However, while this may be a conservative approach, actual adverse health effects on individuals or populations of wildlife or avian species are not certain to occur at the NOAEL intake. Figure 7-23 presents the minimum and maximum NOAELs, or no observed adverse effects levels for populations, for several receptors and chemicals based on the information in Tables 7-20 and 7-21. Since the TBV is the denominator in the HQ, a change in the TBV affects the magnitude of the HQ. There is typically a range from a factor of 5 to over 100 in the NOAEL used as the TBV to higher NOAELs or LOAELs (e.g., chromium for plants). This indicates

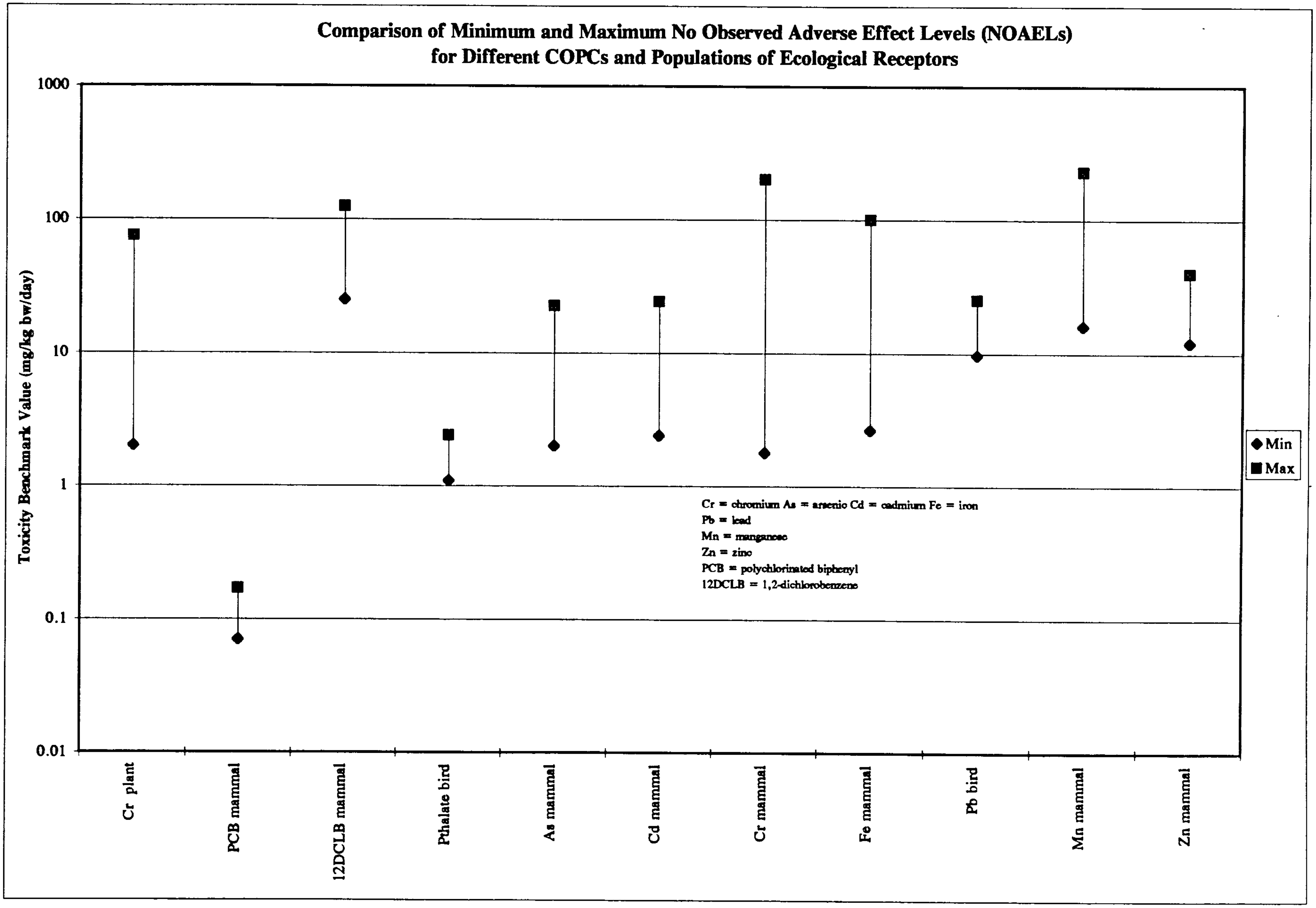


Figure 7-23. Comparison of Minimum and Maximum NOAELs for Different COPCs and Populations of Ecological Receptors

that the HQs, while treated as point estimates, also contain some uncertainty based on the underlying toxicity data.

For some COPCs, TBVs were lacking for some or all of the receptors. For example, there are no TBVs for avian species for explosives. This may serve to underestimate risk since no HQs were available to contribute to the HI.

7.6.6.1 *Uncertainty Factors Greater Than or Equal to 500*

Uncertainty factors are incorporated into the TBVs to reduce the TBVs to safe levels to account for the quality of the TBV for any given receptor. A TBV specific to the receptor in question based on a chronic study is less uncertain than an acute TBV for an unrelated species. Incorporation of UFs is expected to overestimate risk. Table 7-86 presents a summary of the COPCs that had total UFs greater than or equal to 500.

Following discussions with the USEPA (July 1996), it was agreed to evaluate those COPCs with UFs greater than or equal to 500 in a qualitative manner. Thallium was the only COPC with a UF greater than or equal to 500 for which HQs at any location exceeded 1. The only receptors affected by this were birds. The uncertainty to the risk assessment is minimal and limited to the following receptors at the following locations:

- Passerine birds (UF=500)—1/1d, 1b, 1c, 4, 10,11, 12/15, 14, 20, 21, 26, 27, 28, 34, 37, 38, 42, 45, and the RSA
- American kestrel (UF=500)—1/1d and the RSA
- Great horned owl (UF=500)—RSA

Passerine birds—The RSA soil HQ for thallium, based on nondetects, was 49.2. HQs equal to the RSA HQ were observed for all ESA SWMUs with the exception of SWMU 21 (HQ=20), where the AUF was less than 1/2 of the other AUFs for those locations. These values were based on the TEAD current data on a SWMU basis. A somewhat higher value was observed for SWMU 42 based strictly on the TEAD historic data HQs.

American kestrel—HQs for the soil data (TEAD current data on an ESA basis) were all less than 1 (RSA=2.8), with all values based on non-detects. SWMUs 1/1d (HQ= 1) was the only location where the thallium HQ approached 1 for the TEAD historic data.

Great horned owl—The RSA soil HQ for thallium was approximately 1 (0.99) based on non-detects. All other ESA SWMU HQs for thallium, also based on non-detects, were very low. All thallium HQs were very low for the TEAD historic data.

7.6.7 Uncertainty Due to Contaminant Uptake and Bioavailability

Uncertainty due to uptake by biota was minimized by sampling species at different trophic levels. Uncertainty in contaminant uptake and bioavailability was evaluated by calculating

BAFs between biota and soil (Appendix I). There was a tendency for BAFs to decrease with increasing soil concentrations. Figures for mean BAFs are located in Appendix I, which present estimated BAFs by location. A general characteristic for all of the analytes appears to be that there is an order of magnitude variability of the BAFs for different plant species and locations. The wide variation in BAFs may be related not to contaminant bioavailability but to spatial variability (refer to Section 7.6.9). Measured data reduce uncertainty in the risk assessment; risks to consumers of plants and invertebrates are thus less uncertain than risks to predators of jackrabbits.

Tissue concentrations in consumer species are dependent on dietary as well as soil concentrations. The BAFs relative to soil for invertebrates and jackrabbit are, therefore, overestimated by calculating the ratio of tissue to soil. These BAFs could have been used, if necessary, to derive contaminant concentrations in TEAD historic SWMUs where biota samples were not collected. Following discussions with the ETAG (ETAG 1997), additional dietary calculations were deemed unnecessary for this baseline ERA.

Contaminant uptake was evaluated with measured data and model output. The dynamic food web equations describe the exponential relationship of uptake of COPCs from abiotic media. This process is not linear and will predict a leveling of the curve with time, which is driven by the uptake and loss rates. Modeled inorganic jackrabbit Cterms were used to calculate dietary intakes where a value was predicted by the model and measured data were lacking (i.e., at all ESA SWMUs *except* SWMUs 42/45 where jackrabbits *were* collected). Since the dynamic food web model was initially calibrated with the RSA data, and the calibration verified and adjusted as needed with data from SWMUs 42/45, an accurate estimate of dietary intake was possible. One-half (1/2) the MDL was used for the Cterm where individual inorganics were not modeled because the BAFs were less than 0.5 (i.e., Al, As, Ag, Be, Co, Cr, Fe, Mn, Ni, V), and where jackrabbit tissue data were not available (i.e., SWMUs 1b/1c, 10/11, 12/15, 21/37). Further examination of the soil and jackrabbit data reveal that using 1/2 the MDL may underestimate risk in the dietary pathway for jackrabbit predators for As, Co, Cr, Mn, Ni, and V. For Ag, there were no detections in soil at the ESA SWMUs, so this element need not be considered. Risks due to Be were overestimated by use of 1/2 the MDL. The 1/2 MDL Cterm for Be was higher than the Cterm value derived from the BAF for the SWMU having the highest mean BAF. Al and Fe were addressed qualitatively since reference area and background concentrations were high.

Modeled values were used to predict dietary risks to jackrabbit predators for the pesticides and several of the common dioxin congeners. For dioxins, 1/2 the MDL was a higher number than the modeled results, which is overly conservative. Herbicides were overestimated by use of 1/2 the MDL, given that these are not to be expected in tissues of higher trophic level animals. Since PAHs were not modeled, they were overestimated by use of the maximum Cterm of any PAH (pyrene) detected in jackrabbit tissue to represent the Cterm for all other PAHs at those ESA SWMUs lacking jackrabbit tissue data. Therefore, the overall bias to the dietary intake for jackrabbit predators (kit fox, large raptors) is expected to be minimal since some analytes may be overestimated and others underestimated.

The dynamic food web model was developed and used to predict jackrabbit tissue concentrations at all SWMUs except the RSA and SWMUs 42/45, where measured data were available. Tables 7-3, 7-5, 7-7, and 7-10 present the model fit to measured data for the dioxin, pesticides, inorganics, and explosives that were modeled. The assumptions in the modeled dietary pathway were conservative because AUFs were not applied in the prediction of plant, invertebrate, or jackrabbit tissue concentrations. Underestimation of tissue residues by factors of more than 10 occurred primarily in invertebrates. Overall, model fit was poorest for dioxins in invertebrates, where concentrations were underestimated by factors of over 1,000 at SWMU 10. This indicates a potential for underestimation of risk to insectivorous species. However, in most cases, the risk estimates for insectivores were based on measured and not modeled concentrations in invertebrates. The model was able to predict tissue concentrations of other analytes more closely; most comparisons of model fit to data were within a factor of 10 for DDE or DDT (41/48 cases). For inorganics, the model fit was within a factor of 10 for 176 of 192 comparisons (8 analytes, 11 locations, and 3 receptors). Only plants were modeled for explosives, and the model fit was within a factor of 10 for 21 of 22 comparisons. Thus, the impact of underestimating tissue concentrations on the risk assessment results is minimal for all types of analyte-receptor pathways except dioxin risks to mammalian and avian insectivores.

7.6.8 Uncertainty Due to Contaminant Interactions

The interaction of exposure to multiple contaminants or mixtures of contaminants is very complex. Interactions can be synergistic, antagonistic, or additive. Synergistic interactions are those that are more severe than exposure to either chemical alone (e.g., one chemical potentiates the effects of another) and can be pictured by the following equation:

$$a+b=2ab \qquad \text{(Equation 7-37)}$$

Antagonistic interactions are those that are less severe due to exposure to the chemical mixture than to either chemical alone:

$$a+b=\frac{a+b}{2} \qquad \text{(Equation 7-38)}$$

Additivity implies that effects of exposure to more than one chemical are equal to the sum of the effects due to each analyte individually. The risk assessment addresses exposure to each contaminant separately by the HQ and then assumes that the contaminant interactions will be directly additive by summing each of the HQs to obtain an HI:

$$HI_{total\ (1\,to\,i)} = HQ_1 + HQ_2 + HQ_3 + \ldots HQ_i \qquad \text{(Equation 7-39)}$$

Additivity would primarily be expected to occur for chemicals with similar modes of action and target organs. For example, toxicity due to the organochlorine pesticides aldrin and dieldrin, or of DDT, DDD, and DDE, is likely to be additive due to the pharmacokinetics and pharmacodynamics of these chemicals. Many essential metals, however, can exhibit antagonistic effects on each other and on other nonessential, toxic metals. The presence of zinc and/or copper actually ameliorates toxicity due to exposure to cadmium or lead. If the true effect is synergistic, then the assumption of additivity is not conservative and risk is underestimated. If the true effect is antagonistic, the assumption of additivity is overly conservative and risk is overestimated.

7.6.9 Uncertainty Due to Location Variability

Spatial variability of contamination at any location adds to the uncertainty of the risk assessment. The effects on the risk assessment are minimized by the use of a biased study design in that samples were collected in areas of known or suspected contamination. Since large areas of any given area or SWMU may be uncontaminated, the biased sampling design is more likely to overestimate rather than underestimate the true Cterm. There is always a possibility that the highest contaminant levels may not have been found. In addition, there is substantial variability between samples collected at any given area or SWMU as indicated by the various sample standard deviations shown in the summary statistics tables in Appendix I. Because the UCL95 increases with the variance in the samples, variation within a location is likely to cause overestimation of site risks.

It is also possible that contamination exists at the RSA or nearby. This can potentially increase the uncertainty associated with the use of the RSA as a "background" or uncontaminated reference location.

The assumption for the statistics used to represent the Cterm is that the co-located soil samples were from a normal distribution when, in fact, much environmental data may be lognormally distributed. This can underestimate or overestimate risks depending on the true underlying distribution.

7.6.10 Uncertainty Due to TEAD and RSA Background Soil "Inherent" Risks

The "inherent" risks attributed solely to soil type at TEAD and the RSA, as discussed at the beginning of Section 7.4, also need to be considered when interpreting overall risks to ecological receptors at TEAD. For a significant number of metals for both the RSA and TEAD background UBCs, the HQs and HIs, which are derived exclusively from soil data, represent a large contribution to the total HIs. Notably, TEAD background soil HQs based on UBCs exceed 1 as follows:

- Passerine birds—barium, chromium, iron, manganese, thallium, and zinc
- American kestrel—thallium

- Great horned owl—iron
- Golden and bald eagles—iron and thallium
- Deer mouse—aluminum, iron, and thallium
- Mule deer—aluminum and iron
- Jackrabbit—aluminum, iron, and thallium
- Kit fox—aluminum, cobalt, iron, and thallium
- Plants—aluminum, arsenic, antimony, thallium, vanadium, and zinc
- Soil fauna—aluminum, chromium, and iron.

Exceedances for the same COPCs exist for the RSA HQs (Table 7-30). The ubiquity of these analytes in TEAD and the RSA soils leads to the conclusion that impacts on ecological receptors may be closely associated with naturally occurring variations in soil type. These COPCs contribute to the inherent risk and inflate the HIs. This causes overestimation of risks within TEAD that are due to site-related activities.

7.6.11 Uncertainty Due to Exposure Scenarios and Exposure Parameters

7.6.11.1 *Exposure Scenarios*

In the risk assessment, the Cterm for jackrabbit was used to predict tissue concentrations in all prey mammals. This then provided the basis for estimating dietary exposure by carnivores. The carnivore scenario may bias risks in either direction. Risks are overestimated if the jackrabbit accumulates higher levels of COPCs than other animals, and underestimated if other prey animals accumulate higher levels.

The average of the analyte-receptor-specific HQs for up to four plant species sampled were used to represent concentrations in vegetation, and the average of the analyte-receptor-specific HQs for both invertebrate taxa was used to represent the invertebrate component.

The plant data were used to represent the seed, fruit, or vegetative concentrations in the passerine diet. In actuality, the HQs were calculated before the dietary percentages were applied. This approach is mathematically equivalent to taking 33 percent of each Cterm concentration prior to derivation of HQs.

The omnivore, insectivore, and herbivore pathways can have risks biased in either direction. Measuring the different trophic levels reduces risks in these scenarios.

The estimates of risk due to surface water ingestion are highly conservative because the sources of water are intermittent and do not provide a constant source of exposure. Therefore, comparing the chemical intake (i.e., dose) to TBVs that are based on chronic toxicity values is conservative and leads to an overestimation of risk. The surface water intakes actually represent acute or subacute exposures which occur only when surface water is present. No HQs for surface water ingestion exceeded 1 when intakes were compared to chronic toxicity values; therefore, acute TBVs, by which to make the analysis more realistic, were not

obtained. AUFs were not applied because of the assumption that multiple home ranges may overlap at a water source. Risk due to surface water ingestion is likely overestimated.

Risk due to exposure to multiple SWMUs is evaluated by use of ESA-wide risks. ESA-wide risks are conservative since the Cterms (or exposure point concentrations (EPCs)) are biased high due to collection of soil data within SWMUs where previous investigations indicated contamination. This biased approach contrasts with random sampling, which would give an unbiased EPC, and conservatively biases risk estimates upward.

Biota data reduce the uncertainty in the dietary pathway. Where data were available (i.e., the ESA SWMUs), these data were used to predict dietary exposure. While the dietary intakes of the metals, munitions, and pesticides can be adequately modeled, dioxins cannot be as accurately predicted in diet relative to higher trophic level species. This is because the soil analytical methodology was not as sensitive for dioxins as that methodology used for the biota, and so the correlation between biota and soil is not as strong. Since dietary intakes were calculated at only the ESA SWMUs, absolute risks at the historic SWMUs may be underestimated. The amount of bias will vary by chemical; risks for contaminants that bioaccumulate will likely be underestimated (i.e., DDT, DDE), while risks for contaminants that are readily metabolized (i.e., herbicides) will be adequately addressed.

The major uncertainties in the soil ingestion pathway are due to species and spatial variability. Species-related uncertainty occurs because soil ingestion rate data are unavailable for all species selected as receptors. Spatial uncertainty occurs because soil ingestion rates may vary by location due to differences in soil type, habitat quality, and percent cover. For example, animals foraging in high quality habitat with dense cover may not graze or browse as close to the soil surface, thereby reducing soil ingestion. Another source of spatial uncertainty in the soil ingestion pathway is due to the variability in contaminant concentrations by location. Use of the maximum of UCL95 as the Cterm (or EPC) is expected to prevent underestimation of risk due to spatial uncertainty. Use of the 95th percentile for exposure rates is expected to prevent underestimation of risk due to species-related uncertainty.

Dermal exposure was not modeled quantitatively in the SWERA. Current USEPA guidance (USEPA 1992e and USEPA 1996a) suggests that dermal uptake is low for metals (skin absorption factor (AF)=0.01 for inorganics) and for organics (AF=0.1). Relative to the dietary and soil ingestion pathways for ecological receptors, the dermal pathway is expected to be minimal (Appendix I).

7.6.11.2 *Exposure Parameters*

The uncertainty in the exposure parameters is due to the inherent variability within each parameter as represented by the standard deviation in Table 7-1. Uncertainty also occurs due to the extrapolation of data from one species to another, as well as individual and seasonal variability. The 95th percentile of the available data for each receptor was conservatively used

as the exposure statistic to estimate intakes (or doses). This means that 95 percent of the actual ingestion or other exposure rates will be below the predicted intake.

<u>Deer Mouse</u>

Measured data were available for all of the deer mouse parameters thereby reducing uncertainty. Dietary ingestion rates were based on measured data. Use of the 95th percentile is expected to adequately, and conservatively, correct for uncertainty in the exposure parameter.

<u>Kit Fox</u>

Dietary ingestion rates for kit fox were based on measured data for a similar, closely related species, the red fox. Use of the 95th percentile is expected to adequately, and conservatively, correct for uncertainty in the exposure parameter.

Body weights and ecology data for kit fox were obtained from literature (O'Neal et al. 1987; Egoscue 1956; Fitzgerald et al. 1994). Wild kit fox do not seek out free water, but exist primarily on metabolic water. Furthermore, they do not move more than 3 km from dens (Fitzgerald et al. 1994), thus limiting access to water. Laboratory-raised kit fox do utilize free water regularly. Wild fox will fall below the curve on an allometric equation based strictly on body weight without regard to ecology. Therefore, the water ingestion rate for the kit fox was reduced to 1/3 that predicted by an allometric equation for laboratory mammals. This is a source of uncertainty addressed in the uncertainty analysis by comparing HQs developed with the allometric value and the value that incorporates the animal's ecology. The use of this reduction factor is further justified not only by animal ecology, but because surface water is intermittent at TEAD.

Any HQ that is less than 0.5 based on exposure parameters incorporating the animal's ecology will not result in an HQ in excess of 1 for surface water exposure if the WIR is multiplied by 3. HQs greater than 0.5 result in an HQ of 2 or more when multiplied for the exposure factor of 3. All HQs for surface water exposure for the kit fox were less than 0.2; thus, any additional potential exposure would not result in HQs greater than 1 (Appendix I).

<u>Mule Deer</u>

Dietary ingestion rates for mule deer were based on allometric equations. Use of the 95th percentile is expected to adequately, and conservatively, correct for uncertainty in the exposure parameter.

Body weights and ecology data for mule deer were obtained from recent literature (Fitzgerald et al. 1994). Mule deer do not apparently seek out free water, but exist primarily on metabolic and dietary water (Chew 1965; Fitzgerald et al. 1994). Chew (1965) noted that ruminants drank on only 8 to 12 percent of any given days when on fresh forage, and 42 to

53 percent of the days when on dry silage. Surface water is intermittent at TEAD. Since water ingestion is likely overestimated, the WIR was divided by 3 for use in the SWERA.

Jackrabbit

Dietary ingestion rates for jackrabbit were based on allometric equations. Use of the 95th percentile is expected to adequately, and conservatively, correct for uncertainty in the exposure parameter. Several sources were utilized to predict jackrabbit dietary ingestion. Jackrabbits eat 0.54 lbs/day forage (244.9 g/d), and a median body weight of 2162 g was applied to develop an ingestion rate (Fitzgerald et al. 1994). Seventy-four jackrabbits reportedly consume as much forage as one cow, and 5.8 to 30 jackrabbits consume as much as one sheep (Fitzgerald et al. 1994). Estimates of the jackrabbit DIR were made by dividing the DIR for a cow (0.05 g/g/d) or a sheep (0.04 g/g/d) (Sax 1992) by the equivalent number of jackrabbits. Finally, allometric equations for generic mammals were applied.

Water ingestion by jackrabbits is likely overestimated. This conservatism is appropriate because these estimates could apply to other medium-sized mammals with a wide home range. This is more likely to overestimate rather than underestimate risks.

Passerine Birds

Dietary ingestion rates for passerine birds were based on measured data for two different species, including different age levels; this helps to incorporate a wider range of uncertainty in this estimate. Use of the 95th percentile is expected to adequately, and conservatively, correct for uncertainty in the exposure parameter.

Measured data were preferred over values predicted from allometric equations. However, recognizing that passerine bird water-ingestion rates will vary by species, age, and season, allometric equations were applied to determine the uncertainty in avian water-ingestion rates. This source of uncertainty is addressed by comparing HQs developed with the allometric value and the value that incorporates the animal's ecology.

Given the wide range of body weights exhibited by members of this Order, water-ingestion rates could vary from 0.055 to 0.14 g/g bw/d, or a factor of approximately 2-3 relative to the value used to estimate exposure. Any HQ that is less than 0.5 based on exposure parameters incorporating the animals ecology will not result in an HQ in excess of 1 for surface water exposure if the WIR is multiplied by 3. HQs greater than 0.5 result in an HQ of 2 or more when multiplied for the exposure factor of 3. All HQs for surface water exposure were less than 0.02; thus, any additional potential exposure would not result in HQs greater than 1 (Appendix I).

Due to the concern of the USEPA that a risk assessment was not performed for every possible passerine bird feeding guild, a Monte Carlo simulation using Crystal Ball (Decisioneering) was conducted. The simulation is similar to selecting a random card from a deck of cards; the single card represents a number, the deck of cards represents the distribution; the selection of a

number from the "deck" happens with each iteration or trial; the number of trials is set to some large number at the start of simulation (e.g., 1,000 or 5,000). Dietary intakes (i.e., doses), body weight, dietary ingestion rate, and fraction soil in diet were distributions that were randomly sampled from in this simulation for the passerine bird, but the values were the same for each feeding guild (Appendix I). The body weight, soil fraction in diet, and dietary ingestion rate represented the three decks of cards (or three distributions). The Monte Carlo simulation then created a forecast distribution from these three distributions.

Four feeding guilds were examined: herbivores, insectivores, carnivores, and an omnivore which was assumed to consist of 1/3 each of the other guilds. Measured concentrations in soil, plants, invertebrates, and jackrabbits from SWMUs 42/45 at TEAD were used to run the simulation. Cadmium, lead, DDE, OCDD, and RDX were the COPCs evaluated. The null hypothesis that contaminant intakes (or doses) are the same for species having different dietary preferences was tested. The results and Monte Carlo output are provided in Appendix I, which show that all intakes, regardless of dietary preferences, overlap and are nearly identical. Therefore, the evidence indicates there is no underestimation of risk to avian species by using the "generic" passerine bird scenario. Figures 7-24 through 7-26 present the graphical output of the Monte Carlo simulations for each analyte.

American Kestrel

Dietary ingestion rates for American kestrel were based on measured data. Use of the 95th percentile is expected to adequately, and conservatively, correct for uncertainty in the exposure parameter.

Water ingestion was based on measured data, and therefore is expected to be adequate for this species; this number is likely more representative than one based on an allometric equation for various avian species. Kestrels consume invertebrates, which may not have as high a water content as vertebrates; kestrels may thus require more water than the large raptors preying strictly on vertebrates. Therefore, the kestrel water ingestion rate was not adjusted downward to reflect absence of water at TEAD for extended periods.

Large Raptors

Dietary ingestion rates for large raptors were based on measured data. Use of the 95th percentile is expected to adequately, and conservatively, correct for uncertainty in the exposure parameter.

Birds maintain homeostasis in terms of salt and water content of the body, and carnivorous birds that prey on vertebrates maintain homeostasis without access to drinking water because water in the food (60 to 70 percent by weight) provides an adequate water source (Phillips et al. 1985). Small *Accipters* under moderate conditions of temperature and humidity maintain positive water balance by use of the salt glands to perform osmoregulation. Even under desert conditions, when evaporative water loss is expected to be 10 percent of the body weight per day, water balance can be maintained (Phillips et al. 1985). Therefore, the water ingestion

rate was reduced to 1/3 that predicted by an allometric equation for all raptorial birds. This is a source of uncertainty addressed in the uncertainty analysis by comparing HQs developed with the allometric value and the value that incorporates the bird's ecology. The use of this reduction factor is further justified not only by animal ecology, but because surface water is intermittent at TEAD.

Any HQ that is less than 0.5 based on exposure parameters incorporating the bird's ecology will not result in an HQ in excess of 1 for surface water exposure if the WIR is multiplied by 3. HQs greater than 0.5 result in an HQ of 2 or more when multiplied for the exposure factor of 3. All HQs for surface water exposure for any of the raptor species were less than 0.02; thus, any additional potential exposure would not result in HQs greater than 1 (Appendix I).

Area Use Factor

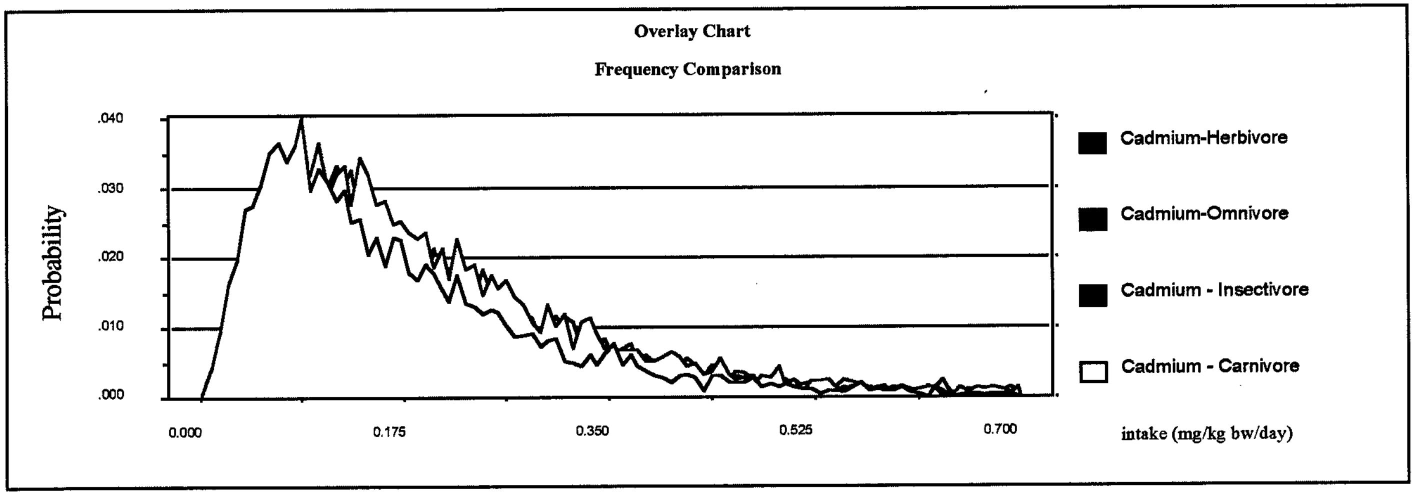
The detection limits for the soil and biota samples were the same for all COPCs at both the ESA SWMUs and the RSA. HQ calculations include the incorporation of AUFs. The ESA SWMU AUFs are smaller than the RSA AUF, thereby resulting in an apparent higher risk at the RSA given that detection limits for all COPCs at both the RSA and ESA SWMUs are the same. However, the RSA is large, lacking in anthropomorphic boundaries, as opposed to the SWMUs, which are similar in size and sometimes confined. Therefore, risks are not expected to be overestimated or underestimated due to the use of this parameter.

A comparison in the HIs by receptor with and without the use of the AUF has been provided (see Appendix I of the SWERA report). The relative increase in the HI for each receptor is indicated in parentheses:

- Passerine—no change at ESA-1, ESA-2, RSA
- American Kestrel—ESA-1 (x 5.5), ESA-2 (x 2.6), RSA (no change)
- Great Horned Owl—ESA-1 (no change), ESA-2 (x 45), RSA (x 1.2)
- Golden Eagle—ESA-1 (no change), ESA-2 (x 45), RSA (x 1.25)
- Bald Eagle—ESA-1 (no change), ESA-2 (x 45), RSA (x 1.25)
- Deer Mouse—no change at ESA-1, ESA-2, RSA
- Mule Deer—ESA-1 (x 5), ESA-2 (x 2.2), RSA (no change)
- Jackrabbit—ESA-1 (x 1.2), ESA-2 (no change), RSA (no change)
- Kit Fox—ESA-1 (x 60), ESA-2 (x 27), RSA (no change)

Animals with home ranges larger than the ESA showed an increase in risk by 2 or more times (i.e., large raptors, mule deer, kit fox). However, since one purpose of the risk assessment was to define the risks associated with each SWMU, the AUF is a critical component of the analysis since nearly all of the TEAD SWMUs are too small to support ecological populations. Therefore, species with large home ranges are not expected to be constantly exposed to the ESAs. In addition, migratory habits were not included in the risk estimates; many species at TEAD are migratory, which would effectively limit exposure to subchronic levels; use of the chronic TBVs thus can overestimate risk to migratory species. In addition, the use of the AUF

Monte Carlo Simulation Results for Cadmium - Passerine Birds



Monte Carlo Simulation Results for Lead - Passerine Birds

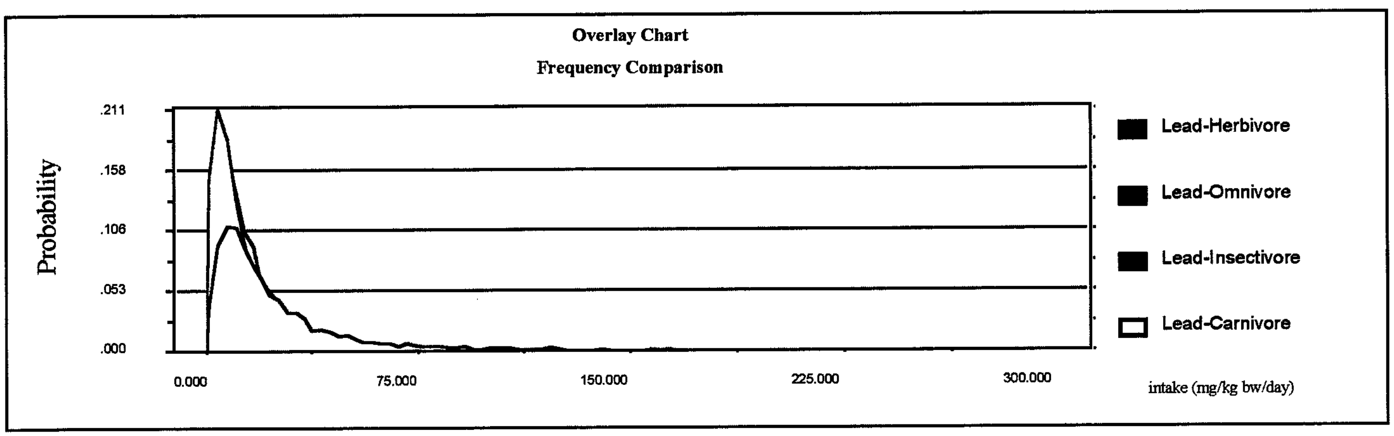
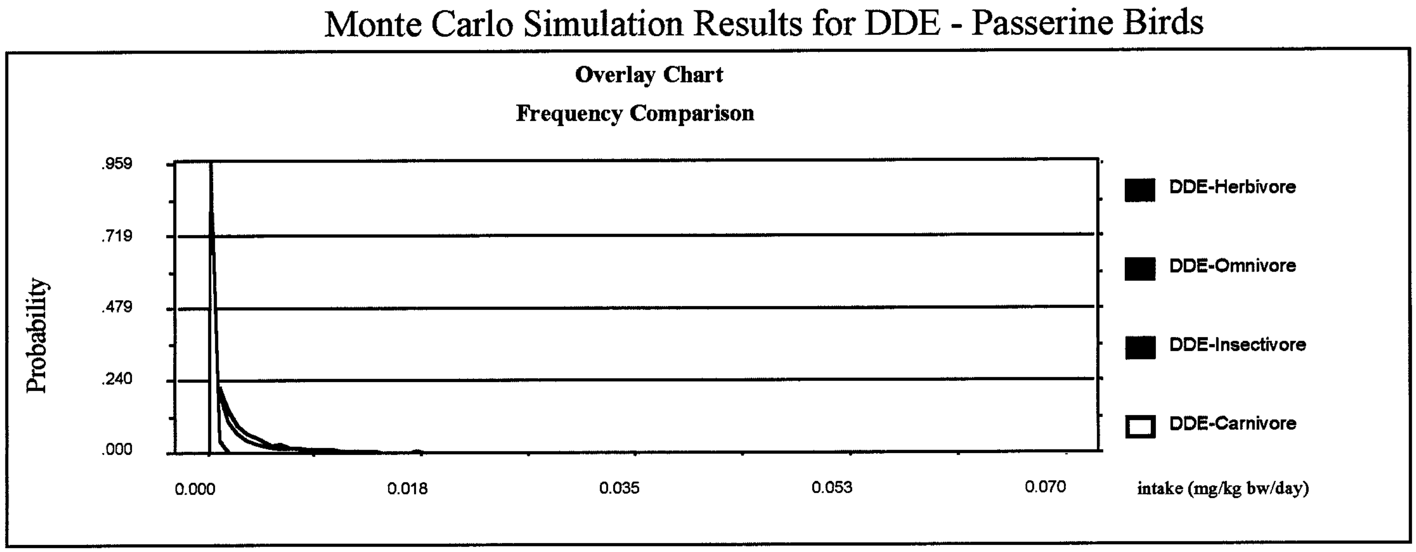


Figure 7-24. Monte Carlo Simulation Results for Cadmium and Lead in Passerine Birds



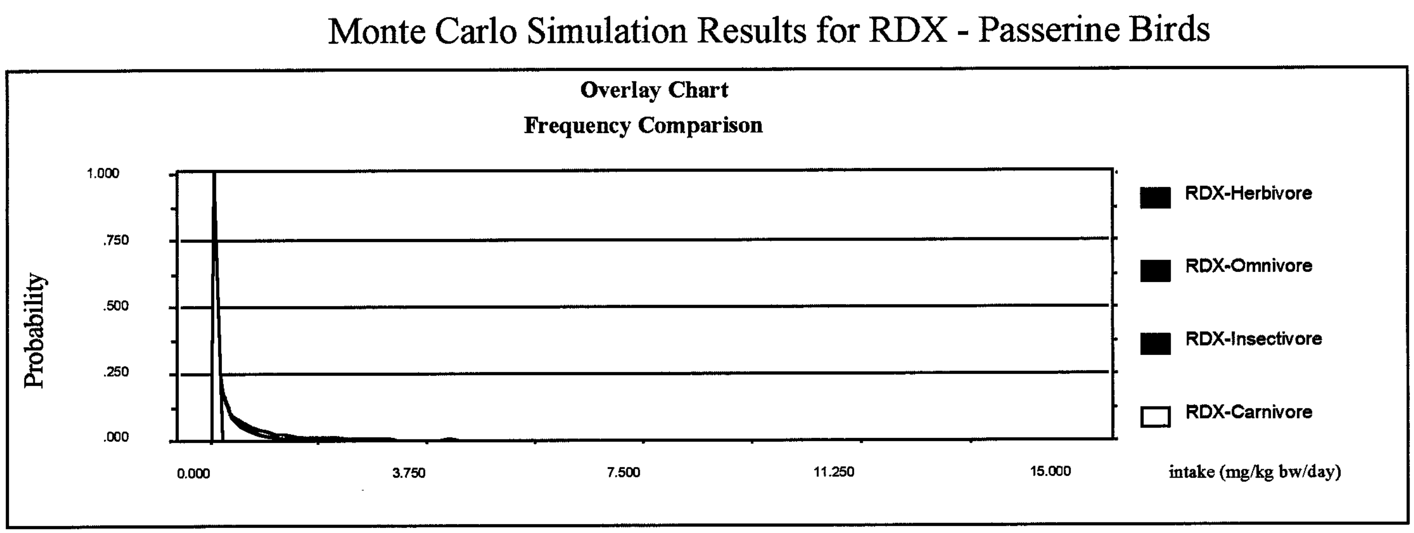


Figure 7-25. Monte Carlo Simulation Results for DDE and RDX in Passerine Birds

Monte Carlo Simulation Results for OCDD - Passerine Birds

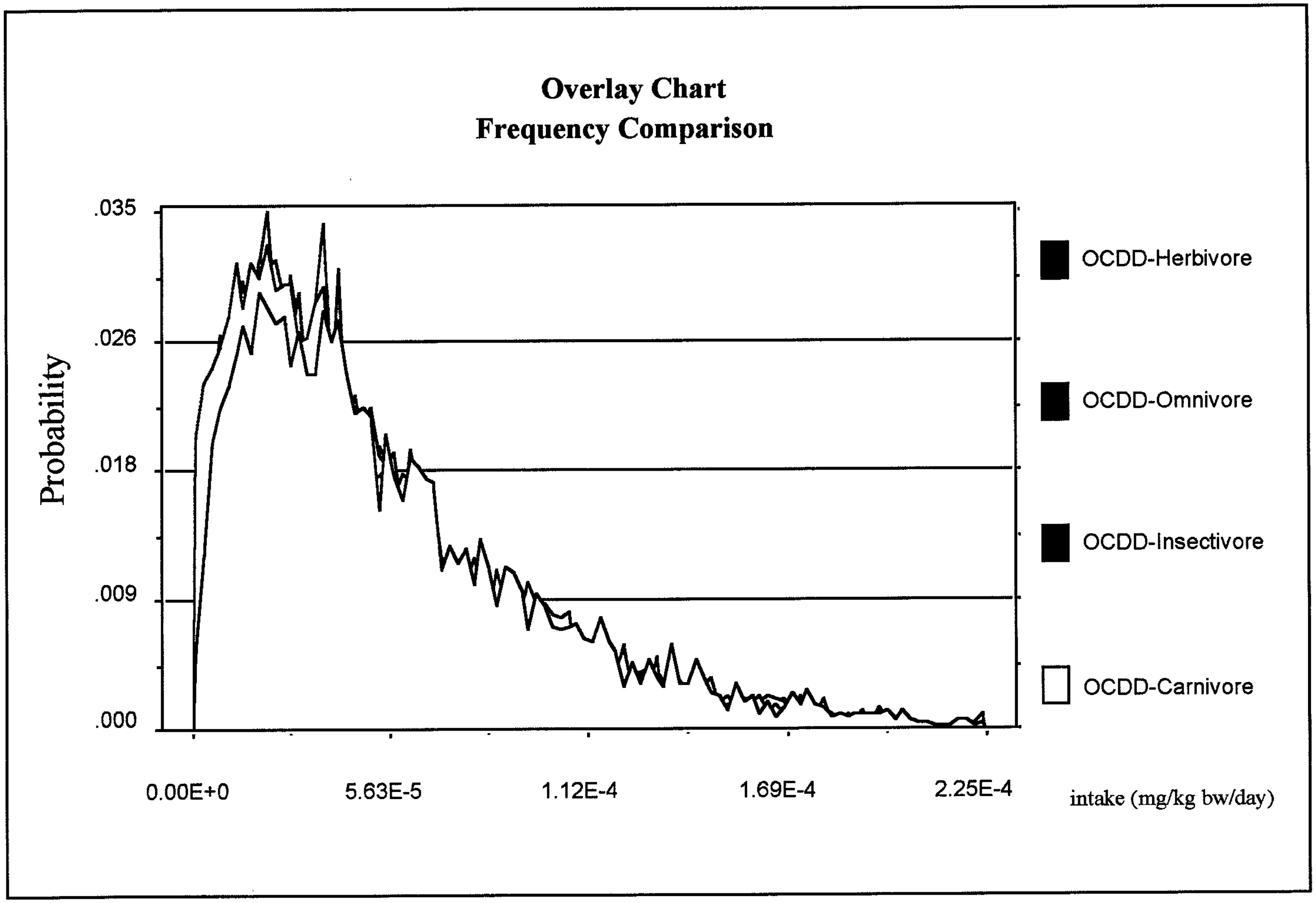


Figure 7-26. Monte Carlo Simulation Results for OCDD in Passerine Birds

does not affect risk to the animals with the highest exposure rates that would be expected to be impacted on a population level (i.e., small mammals and birds). Thus, the overall impact on the risk interpretation is expected to be minimal.

7.6.12 Uncertainty in Analytical Data and Exposure Point Estimates - Aquatic Ecosystem

The analytical data contain some element of measurement error because there is spatial variability for COPC concentrations in sediment and water. However, maximum detected values were used, and this is expected to compensate for measurement error or spatial variability. The exposure point concentrations based on these data are subject to variability, not only in space but also time, although they are represented as a point estimate. Again, the use of the maximum concentration is expected to provide exposure point concentrations that adequately assess risk. In addition, two different data sets were used to assess risk (SAIC 1994 and Montgomery Watson 1992). This presented an opportunity to independently evaluate similar data types collected by two different contractors, analyzed by two different laboratories, and separated by a 2-year time span. By evaluating the two data sets separately, uncertainty should be reduced, since any discrepancies between the two sets of analytical data should result in conflicting risk assessment conclusions. No discrepancies in the risk assessment conclusions were observed.

7.6.13 Uncertainty in the Exposure Parameters - Aquatic Ecosystem

Exposure parameters are a source of uncertainty because the ingestion rates are not available for every species at SWMU 14. By utilizing 95th percentile data for shorebirds, which feed in sediments and have a high fraction of sediments in their diet, estimates of potential risk are expected to be protective of other avian species with lower exposure rates. In addition, risks were calculated for ducklings, which have a higher ingestion rate than adults. Use of the 95th percentile exposure parameters for the duck and shorebird are expected to overestimate risks for these receptors at SWMU 14. In addition, the water ingestion rate actually applied to the eagle was higher than the 95th percentile value used for the terrestrial scenario; this would likely overestimate risks to this receptor at the Sewage Lagoons.

7.6.14 Uncertainty Associated With Qualitative COPCs

Several COPCs were evaluated qualitatively, and except for iron and aluminum, their HQs were not included in the overall HI for each receptor at any given SWMU. The COPCs evaluated qualitatively were listed in Table 2-12 and include VOCs, anions, pH, dibenzofuran, bromacil, and PETN. The uncertainty involved in addressing COPCs qualitatively is that if they were stable or highly toxic, risk at a SWMU at which these COPCs occurred would be underestimated. Perhaps the greatest impact would be if a SWMU were left out of the risk assessment because only these compounds, and no others, occurred. However, the organic COPCs not quantitatively addressed are typically not predicted to be stable in the environment,

such that risk will rapidly decrease with time. Another potential impact would exist if there were no toxicity benchmarks or sufficient data for a surrogate with which to make an informed decision. Additional field effort or bioassays are the only mechanisms available by which to quantitate the risks due to these compounds.

While not addressing the anions may lead to an underestimation of risk, toxicity is likely to be driven by the metal (cation) component for those anions addressed in the SWERA.

7.7 RISK DESCRIPTION AND INTERPRETATION

The TEAD SWERA risk description and interpretation, and conclusions and recommendations for both the terrestrial and aquatic ecosystems are summarized in Table 7-87. Tables 7-88 through 7-125 provide summary level presentations of the risk drivers and exposure pathways driving risk, and ecological, spatial, and toxicological relevance on a SWMU-by-SWMU basis. Tables 7-126 through 7-128 provide summary level descriptions of risks associated with ESA-1, ESA-2, and the RSA. Any quantitative estimates of impacts on population sustainability are purely speculation.

7.7.1 Risk Description

The risk description section summarizes the results of the risk assessment and draws conclusions based on the quantitative results of the risk characterization. The risk description is based as well on the semi-quantitative and qualitative results of the ecological effects sections (i.e., Stress Response), given that the uncertainties inherent in the risk assessment process are considered. The goal of this section is to highlight major ecological risks and the lack thereof for the risk managers.

There are several types of information that should be considered in the risk description. These include:

- The chemicals that are the risk drivers;
- The exposure pathways contributing the most to the quantitative risks;
- An interpretation of the risk, where the uncertainty analysis and overall WOE incorporated into the HQs and HIs are considered;
- The ecological relevance, where the biometric data (i.e., stress response) are weighed against the quantitative risks predicted by the HQs and HIs;
- The Special Status species relevance, where the population and habitat suitability (e.g., presence of critical or sensitive habitat) information are weighed against the quantitative risks predicted by the HQs and HIs;

- The spatial relevance, where the site characterization data are considered; and
- The toxicological relevance, where the toxicity criteria and exposure intakes are discussed and evaluated for the potential to produce population-level effects or individual effects for the Special Status species.

Based on the above descriptive information, conclusions can be made from the risk assessment process. In order to summarize the large amount of information, major results and conclusions were condensed into Table 7-87.

7.7.1.1 *Risk Drivers*

The chemicals that contribute at least 5 percent of the total HI for each receptor are considered the risk drivers. Only HIs greater than or equal to 1 were included. These chemicals are summarized by receptor for each location.

7.7.1.2 *Exposure Pathways*

Only the pathways that contain HQs greater than 1 are considered major contributors to the overall risk.

7.7.2 Risk Interpretation

Both relative risks (Table 7-87) and absolute risks (Tables 7-129 and 7-130) were calculated for TEAD. Absolute risks are the HIs that are based on Exposure/TBV_{NOAEL}. Relative risks are the ratios of the HI TEAD/HI RSA, and demonstrate the amount of risk attributable to site activities relative to the amount inherent in the ambient environment. Both relative and absolute risks are important to consider when making a risk management decision. Also of importance are the professional judgment and experience necessary in the interpretation of ecological risk.

The evidence is evaluated against the uncertainties inherent in the process. A simple rating system is used in an attempt to reduce all of the complexities into a succinct concept of probability of acceptable or unacceptable risks. Risks were categorized as (1) <u>low</u> probability of excessive risk, (2) <u>moderate</u> probability of excessive risk, and (3) <u>high</u> probability of excessive risk.

HIs that were approximately three times the RSA HIs were assumed to be within the range of uncertainty inherent in the risk assessment process. Risks that were five times the RSA risks were generally rated as moderate to high; HIs for receptors at TEAD SWMUs, which were *more* than five times the RSA HIs, were generally categorized as high risk. The categorization of a SWMU for unacceptable ecological risk was based on many factors including, but not

limited to, the numbers and types of receptors with excessive risks, the WOE, the types of contaminants, risk drivers, habitat suitability, and the alternative lines of evidence established through evaluation of the biometric data.

In order to simplify the risk assessment results and conclusions in Table 7-87, Tables 7-88 through 7-125 present brief summaries on a SWMU-by-SWMU basis, summary of risk drivers by location and receptor, impacts on the ecological receptors (e.g., population sustainability, sensitive or critical habitat), risk implications to Special Status Species, and risk interpretation. Tables 7-126 through 7-127 address these same areas on an ESA basis. Table 7-128 provides a summary level of ecological risks inherent at the RSA. Figure 7-27 shows those TEAD SWMUs with unacceptable or excessive ecological risks. The HIs in the ranges of 1 to 10, 10 to 100, and 100 to 1,000 or above are summarized in Tables 7-129 and 7-130, and are shown in Figure 7-27.

Summary level tables for the following SWMUs and AOCs have not been provided since they were not included in the quantitative risk assessment: 2, 5, 9, 17, 18, 24, 33, 39, 41, 43, 44, 48, 49, 50, 51, 52a through d, 53, 54, 55, 56, 57, and AOCs-3 and -4. Refer to Table 7-87 for information pertaining to these sites.

Table 7-20. Summary of Toxicity Information for Mammals and Birds

Analyte	Analtye Code	Species	NOAEL[a] (mg/kg bw/d)[b]	LOAEL[c] (mg/kg bw/d)	Study Description	Reference	Comment
Acenaphthene	ANAPNE				see Benzo(a)pyrene	see Benzo(a)pyrene	Use BAP[e] for all PAHs
alpha-Chlordane	ACLDAN	Redwinged blackbird	2.13	NA[d]	NOAEL for mortality	Opresko et al., 1993	
alpha-Chlordane	ACLDAN	Bird	14.1	NA	RMA[f] critical value for all birds except duck.	USEPA[g] (Hudson et al., 1984)	Primary citation
alpha-Chlordane	ACLDAN	Mammals	1.2	NA	RMA Critical Value for mammals. NOEL.	USEPA, 1984	Only value
Aluminum	AL	Rat	40	NA	NEL[h] for growth impairment (est. from 6 mg. amount given to 150 gm. rat.)	Venugopal and Luckey, 1978	
Aluminum	AL	Lab animals	NA	200	Growth retardation, alter carbohydrate and phosphate metabolism. 1-2% in diet stimulates growth in other studies. Use this as dose unlikely to affect populations.	Friberg et al., 1979	Growth common endpoint for Al toxicity. Less extrapolation to benchmark than other studies.
Aluminum	AL	Sheep	5.04	60	Dietary levels of 2000 ppm[i] for 56 days decreased weight gain. Convert with 0.03 g/g/d[j] estimated from same study. Control diet 168 ppm (use as NEL). Ruminants likely more sensitive than nonruminants.	Valdivia et al., 1982	
Aluminum	AL	Cow	48	NA	Dietary levels of 1200 ppm did not alter serum or tissue P levels. Convert with 0.04 g/g/d from Sax, 1984.	Valdivia et al., 1978	
Anthracene	ANTRC				see Benzo(a)pyrene	see Benzo(a)pyrene	Use BAP for all PAHs
Antimony	SB	Dog, cat	NA	10	10 mg/kg bw/day caused overt toxicity in dogs and cats.	Friberg et al., 1979	
Antimony	SB	rat	NA	1.78	5 mg/L[k] (converted with ingestion rate of 0.356 L/kg bw/d from Perry et al., 1989) decreased lifespan by 15% in rats. Unlikely to affect population.	Friberg et al., 1979	Clear endpoint, less vague than other
Arsenic	AS	Mallard	14	42	NOAEL @ 100 ppm in diet for behavior (LOAEL was 300 ppm for behavior and growth). Converted with 0.14 kg diet/kg bw from Camardese et al., 1990.	Camardese et al., 1990; Whitworth et al., 1991	Only value
Arsenic	AS	Rat	3.8	22.5	NOAEL (LOAEL was 22.5 mg/kg bw/day for growth, liver lesions)	Schroeder et al., 1968	Clear endpoint, less vague than other
Arsenic	AS	Grazer	2	NA	Maximum tolerated in diet 50 ppm, dwb[l] (convert with 0.04 kg diet/kg bw from Sax,	Bodek et al., 1988	
Barium	BA	Chicken	97	194	NOAEL is 1000 ppm diet. Slight growth depression at 2,000-4,000 ppm. Converted with 0.097 kg/kg bw/d from Wiseman (1987).	Johnson et al., 1960	Only value
Barium	BA	Rat	35.6	NA	NEL for overt toxicity and survival. Caused hypertension. Estimate from 100 ppm in drinking water and 15 ml/45 g bw/d ingestion rate from same study.	Perry et al., 1989	Only value
Benzo(a)anthracene	BAANTR				see Benzo(a)pyrene	see Benzo(a)pyrene	Use BAP for all PAHs

Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
Benzo(a)pyrene	BAPYR	Rat	NA	10	LOAEL for reproductive success	Opresko et al., 1993	Use BAP for all PAHs
Benzo(a)pyrene	BAPYR	Hamster	9.5	45.6	NOEL[a] and LOEL[a] for decreased survival and body weight, 96 week exposure. Converted with assumed body weight of 0.050 kg, inhalation rate of 0.05 m3/d[e] (EPA, 1993).	CEPA, 1994a	Use BAP for all PAHs
Benzo(b)fluoranthene	BBFANT				see Benzo(a)pyrene	see Benzo(a)pyrene	Use BAP for all PAHs
Benzo(ghi)perylene	BGHIPY				see Benzo(a)pyrene	see Benzo(a)pyrene	Use BAP for all PAHs
Benzo(k)fluoranthene	BKFANT				see Benzo(a)pyrene	see Benzo(a)pyrene	Use BAP for all PAHs
Benzyl alcohol	BZALC	Bird	NA	100.0	LD50[b] study	RTECS	Only value
Benzyl alcohol	BZALC	Rabbit	NA	1040.0	LD50 study	RTECS	Only value
Beryllium	BE	Poultry	NA	485	Caused ricketts in poultry, other livestock at 0.5% of diet. Use 0.097 kg/kg bw/day from Wiseman (1987) to convert.	Friberg et al., 1979	Only value
Beryllium	BE	Rat	0.54	NA	NOAEL for weight loss	Opresko et al., 1993	
Beryllium	BE	Rat	NA	42.5	Mild weight loss, 2 yr study. Estimate with 0.085 g/g bw/d (Groton et al 1991).	WHO, 1990b	Clear endpoint, less vague than other. Longterm study.
Bis(2-ethylhexyl) phthalate	B2EHP	Chicken	NA	156	Decreased egg production and body weight, for a 4 week exposure. Higher concentrations caused cessation of laying. Used 1.45 kg body weight (Wiseman, 1987) for hen weight; 226 mg/hen/day intake.	WHO, 1992	Clear endpoint; starling effect actually beneficial.
Bis(2-ethylhexyl) phthalate	B2EHP	Starling	2.4	NA	Increased body weight; 30 day exposure. Converted from 25 ppm w[d]/0.097 g/g bw/day for chicken (Wiseman, 1987).	WHO, 1992	
Bis(2-ethylhexyl) phthalate	B2EHP	Rat	NA	510	Decreased body weight; testicular atrophy; 6,000 12,000 ppm diet converted with 0.085 (Groton et al., 1991).	WHO, 1992	Similar endpoints, select lowest value
Bis(2-ethylhexyl) phthalate	B2EHP	Mouse	NA	780	Decreased body weight; male reproductive effects; 3,000-6,000 ppm diet converted with 0.26 g/g bw/day (EPA, 1993).	WHO, 1992	
Butylbenzyl phthalate	BBZP				see B2EHP for birds	see B2EHP for birds	see B2EHP
Butylbenzyl phthalate	BBZP				see B2EHP for mammals	see B2EHP for mammals	see B2EHP
Cadmium	CD	Mallard	NA	2.0	NOAEL for adults; LOAEL for kidney lesions in ducklings. Lesions uncertain for population effects w/o[f] link to survival or repro.	Cain et al., 1983; White and Finley, 1978	Only value
Cadmium	CD	Rat	2.5	NA	NOAEL for behavior, condition, body weight, food consumption (30 ppm)	Groten et al., 1991	Clear endpoint. Fewer toxicity related UFs.
Cadmium	CD	Rabbit	NA	24.3	Renal effects from 300 ppm diet, 10 month study. Estimated with 0.081 g/g bw/d from Equation 3-9 (EPA, 1993) and assumed body weight of 1.3 kg.	WHO, 1992b	

Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
Cadmium	CD	Grazer	0.002	NA	Maximum tolerated 0.05 ppm dwb, converted with 0.04 kg diet/kg bw, (Sax, 1984))	Bodek et al., 1988	
Chloromethane	CH3CL	NA	NA	NA	NA	NA	
Chloroform	CHCL3	NA	NA	NA	NA	NA	
Chlordane	CLDAN	See ACLDAN for birds			See ACLDAN	NA	
Chlordane	CLDAN	See ACLDAN for mammals			See ACLDAN	NA	
Chromium (III)	CR	Black duck	0.63	NA	NOAEL for adults (0.63 mg/kg bw/d converted with 0.063 kg/kg bw/d for adult from EPA, 1993b)	CEPA, 1994b	
Chromium (III)	CR	Black duck	NA	1.26	10 ppm in diet decreased growth, survival in juveniles (1.26 mg/kg bw/d converted with 0.126 kg/kg bw/d for 100 gm duckling estimated from allometric equations in EPA, 1993)	CEPA, 1994b; EPA, 1993 DIR (g/g bw/d)=(0.495 Wt^(0.704))/BW	
Chromium (III)	CR	Tern	1.28	NA	NOEL for wild populations. Concentration in major prey items 7.6 ppm converted by author. No effect on reproduction or population success.	CEPA, 1994b	Use this study as it concerns the assessment endpoints, for field based population
Chromium (III)	CR	Turkey	NA	0.97	10 ppm in diet converted with 0.097 kg diet/kg bw/d for chicken (Wiseman, 1987) decreased egg production.	CEPA, 1994b	
Chromium (III)	CR	Chicken	9.7	NA	NOEL for 32 days was a 100 ppm diet.	CEPA, 1994b	
Chromium (III)	CR	Cat	20	NA	NEL for 80 day exposure to 50-1000 mg/cat/d; convert with assumed body weight of 2.5 kg.	NAS, 1974a	Use this study since it was long term, in diet. Rat exposure by water could influence absorption.
Chromium (III)	CR	Rat	1.78	NA	NEL for rats exposed to 5 mg/L in drinking water; convert with ingestion rate of 0.356 L/kg bw/d (Perry et al., 1989)	NAS, 1974a	
Chromium (VI)	CRHEX				NA		
Chrysene	CHRY				see BAP	see BAP	see BAP
Cobalt	CO	Duck	NA	2520	LEL[a] for growth was 0.2% of diet. Convert with 1.26 kg/kg bw/day from EPA, 1993 allometric equation and assumed body weight of	EPA, 1993; Friberg et al., 1979 :DIR (g/gbw/d) =(0.495 Wt^(0.704))/BW	Only avian value
Cobalt	CO	Rat	NA	0.039	Altered thyroid function for 150 ug/d in diet. Convert with 0.26 kg diet/kg bw/d from EPA, 1993 for mouse. Unlikely to adversely affect populations.	Friberg et al., 1979	
Cobalt	CO	Rat, rabbit	NA	10	Peroral dose of 10 - 100 mg/kg for more than 2 weeks cardiotoxic.	Friberg et al., 1979	
Cobalt	CO	Mouse	NA	47	Increased mortality for 2.5 month study due to decreased resistance to virus.	Friberg et al., 1979	

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Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
Cobalt	CO	Rat	NA	12	NOAEL for maternal toxicity based on weight gain of food consumption; adverse effects on pup survival and development when given day 14-21 gestation. Pup survival affected at maternal dose of 12 mg/kg bw/d.	Domingo, 1994	Endpoint relates to assessment endpoint
Cobalt	CO	Duck	0.019	NA	Nutritional requirement	Wiseman, 1987	
Cobalt	CO	Birds, mammals	10	NA	All species get polycythemia above this intake.	Venugopal and Luckey, 1978	
Copper	CU	Mallard	29	NA	NOAEL for weight gain, mortality	Opresko et al., 1993	
Copper	CU	Chicken	55.29	72.653	NOAEL of 570 ppm for 10 wks. for weight gain, mortality. At 749 ppm, mortality was 15%, weight reduced 30% relative to controls. Convert with 0.097 g/g bw/d, Wiseman, 1987.	Mehring et al., 1960	Primary citation
Copper	CU	Sheep	1	NA	Maximum chronic intake tolerated for grazers is 25-300 ppm in diet, dwb. Daily intake calculated with 0.04 kg diet/kg bw for cow (Sax, 1984).	Doherty et al., 1969; Bodek et al., 1988; Friberg et al., 1979	
Copper	CU	Sheep	NA	20	Hemolysis after 9 weeks exposure.	Friberg et al., 1979	
Copper	CU	Rat	13	NA	Rats gained more weight on 50 ppm diet; converted with 0.26 kg diet/kg bw/d for mouse (EPA, 1993b).	Friberg et al., 1979	
Copper	CU	Pig	8.5	17	Pigs gained more weight on 250 ppm (8.5 mg/kg bw/d). At 500 ppm diet (17 mg/kg bw/d), anemia occurred. Converted with 0.034 kg/kg bw/d (Wiseman, 1987)	Friberg et al., 1979	
Copper	CU	Mink	7.865	13	25-50 ppm NEL or beneficial. 100 ppm in diet decrease weight gain, may increase kit mortality due to effect on lactation. Controls had 60.5 ppm in diet. Study 357 d duration. Convert w/0.13 g/g/d EPA, 1993.	Aulerich et al., 1982	Since rat and pig study showed doses that were beneficial, UFs optional. If apply UFs, get dose below beneficial level.
Copper	CU	Dog	0.32	NA	Nutritional requirement	NAS, 1974b	
Cyanide	CYN	Mouse	NA	3	LD50	Jorgensen et al., 1991	
Cyclotetramethylene tetranitramine (HMX)	HMX	Rat	NA	150	TDlo[a] (liver, kidney damage, decreased weight gain), subchronic exposure.	Everett et al., 1985	Only value
Dibenzo(a,h)anthracene	DBAHA				see Benzo(a)pyrene	see Benzo(a)pyrene	see BAP
Dibenzofuran	DBZFUR	NA	NA	NA	NA	NA	
Dibenzofuran	DBZFUR	NA	NA	NA	NA	NA	
Dichlorobenzene-nonspecific	DCLB				see 1,2 DCB	see 1,2 DCB	Use 12DCLB
Dibutyl phthalate	DNBP	Ring dove	1.1	NA	NOAEL for shell thickness and other reproductive effects; 10 ppm diet.	Peakall, 1974	see B2EHP
Dibutyl phthalate	DNBP				see B2EHP for birds	see B2EHP for birds	see B2EHP
Dibutyl phthalate	DNBP				see B2EHP for mammals	see B2EHP for mammals	see B2EHP
Dioctyl phthalate	DNOP				see B2EHP for birds	see B2EHP for birds	see B2EHP
Dioctyl phthalate	DNOP				see B2EHP for mammals	see B2EHP for mammals	see B2EHP

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Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
1,2-Dichlorobenzene	12DCLB	Mouse, rat	25	NA	NOEL, subchronic oral study, endpoints of body weight, survival, histopathology, hematology, organ weight range from 25-125 mg/kg bw/d.	CEPA, 1993a	Oral study. Rabbit value has more extrapolation since exposure was by inhalation.
1,2-Dichlorobenzene	12DCLB	Rabbit	1208	NA	NOEL. Converted with body weight of 1.5 kg, inhalation rate of 0.755 m3/d from EPA, 1993.	CEPA, 1993a	Use 12DCLB
1,3-Dichlorobenzene	13DCLB				see 1,2 DCB	Use 12DCLB	Use 12DCLB
1,4-Dichlorobenzene	14DCLB				see 1,2 DCB	Use 12DCLB	Use 12DCLB
2,4-Dichlorophenoxy acetic acid	24D	Rabbit	NA	800	LD50	Sax, 1992	
2,4-Dichlorophenoxy acetic acid	24D	Dog	NA	100	LD50	Sax, 1992	Use this since lowest LD50; likely to protect kit fox.
2,4-Dichlorophenoxy acetic acid	24D	Mouse	NA	368	LD50	Sax, 1992	
2,4-Dichlorophenoxy acetic acid	24D	Rat	NA	500	LD50	Sax, 1992	
Dieldrin	DLDRN	Gray partridge	NA	1.25	LOAEL for mortality for a 30 day study ranged from 1.25 to 5.0	Hudson et al., 1984	
Dieldrin	DLDRN	Chicken	0.97	NA	NEL for mortality for an 8 week study. Converted from 10 ppm diet with 0.097 kg diet/kg bw/d from Wiseman (1987).	Ritchey et al., 1972	
Dieldrin	DLDRN	Barn owl	0.5	NA	NEL for breeding success and mortality.	Mendenhall et al., 1983	Relates to assessment endpoint. More closely related to receptor, GHO.
Dieldrin	DLDRN	Mallard	0.06	3.28	NOAEL of 0.3 ug/g for growth observed for 24 d study. Converted with ingestion rate of 75 g/211 to 379 g bw = 0.20 to 0.36 g/g bw/d at day 24, from same study. LOAEL was 16.4	Nebeker et al., 1992	
Dieldrin	DLDRN	Short-tailed shrew	NA	137.28	14 day LC50 ranged from 66 to 132 mg/kg diet. Converted with ingestion rate of 1.17- 2.08 g/g bw/d from same study.	Blus, 1978	
Dieldrin	DLDRN	Dog	0.05	NA	NOAEL for health, behavior, body weight in 2 year study. Some altered serum chemistry that the authors considered toxicologically unimportant.	Walker et al., 1969	Most appropriate endpoints for chronic studies.
Dieldrin	DLDRN	Rat	NA	2.6	LOAEL for behavior, liver lesions in 2 year study was 10 ppm in diet. This was a NEL for mortality. Converted with 0.26 kg diet/kg bw/d from EPA, 1993b.	Walker et al., 1969	
Dieldrin	DLDRN	Rat	0.26	0.31	Long term study, 0.31 mg/kg bw/d decreased survival slightly in young, decreased conception. At 1 ppm in diet (0.26 mg/kg bw/d converted with value for deer mouse of 0.26 kg diet/kg bw/d from EPA, 1993) altered liver	Newell et al., 1987	
Dimethyl phthalate	DMP				see B2EHP for birds	see B2EHP for birds	see B2EHP
Dimethyl phthalate	DMP				see B2EHP for mammals	see B2EHP for mammals	see B2EHP
2,4 Dinitrotoluene	24DNT	Rat	NA	3.9	TDlo, reproductive effects, chronic	Lee et al., 1985	

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Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
2,4 Dinitrotoluene	24DNT	Dog	1.5	25	TDlo(nervous system, weight gain, reproductive effects; all dogs affected, whereas only 1 dog at 1.5 mg/kg bw/d affected) chronic.	Lee et al., 1975	Most appropriatet endpoints for chronic studies. Less extrapoloation to assessment
Endosulfan II	BENSLF				see Endosulfan I	see Endosulfan I	see Endosulfan I
Endrin	ENDRN	Mallard	NA	0.25	LD50	Hudson et al., 1984	
Endrin	ENDRN	Mallard	0.0315	0.189	NEL for reproductive effects in a 12 week study. Dietary level 0.5 ppm. 3 ppm decreased embryo survival, and decreased male body weight by 4.5%. Convert with 0.063 g/g bw/d from EPA (1993).	Roylance et al., 1985	Longest avian study.
Endrin	ENDRN	Chicken	NA	0.97	LEL for mortality in 8 week long study.	Ritchey et al., 1972	
Endrin	ENDRN	Short-tailed shrew	NA	180.96	LC50[w] for 14 day exposure with range of 87 - 174 mg/kg diet. Converted with ingestion rate of 1.17-2.08 from same study as described under DDT.	Blus, 1978	Only value
Endrin Aldehyde	ENDRNA				see Endrin	see endrin	Use endrin.
Endrin Aldehyde	ENDRNA				see Endrin	see endrin	Use endrin.
Ethylbenzene	ETC6H5	NA	NA	NA	NA	NA	
Fluoranthene	FANT				see BAP	see BAP	Use BAP for all PAHs
Fluorene	FLRENE				see BAP	see BAP	Use BAP for all PAHs
Fluoride	F	Rat	NA	3.2	LOAEL for bone mineralization effects, chronic study with drinking water ingestion. Skeletal effects inconsistant in rats; other studies report NOEL at 5 weeks at 12.7 mg/kg bw/d; LOEL at 21 d of 4.7 mg/kg bw/d.	CEPA, 1993g	Clear endpoint for adverse effect. Lower doses beneficial or unclear effects.
Fluoride	F	Mouse	0.8	79.904	Stimulate bone formation 20% above control. At 363.2 mg/L (79.9 mg/kg bw/d) converted with 0.22 L/kg bw/d ingestion rate for deer mouse (EPA, 1993), decreased survival	CEPA, 1993g	
Fluoride	F	Dog	0.32	NA	Unspecified changes in bone at histopathological level.	CEPA, 1993g	
gamma-BHC (Lindane)	LIN	Mallard	NA	30	LOAEL for mortality for 30 day study	Hudson et al., 1984	
gamma-BHC (Lindane)	LIN	Chicken	0.97	NA	NEL for mortality in 8 week study where chickens given 10 ppm in diet. Converted with 0.097 kg diet/kg bw/d from Wiseman (1987).	Ritchey et al., 1972	Longest avian study.
gamma-Chlordane	GCLDAN	Redwinged	2.13	NA	NOAEL for mortality	Opresko et al., 1993	Only value
Heptachlor	HPCL	Mallard	NA	2080	LD50 exceeded 2,080 mg/kg bw.	Hudson et al., 1984	
Heptachlor	HPCL	Chicken	0.97	NA	NEL for mortality in 8 week study where chickens given 10 ppm in diet. Converted with 0.097 kg diet/kg bw/d from Wiseman (1987).	Ritchey et al., 1972	Longest avian study.
Heptachlor Epoxide	HPCLE				See heptachlor	See heptachlor	See heptachlor
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	678HPD				see TCDD	see TCDD	see TCDD
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	678HPD				see TCDD	see TCDD	see TCDD

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
1,2,3,4,6,7,8-Heptachlorodibenzofuran	678HPF				see TCDD	see TCDD	see TCDD
1,2,3,4,6,7,8-Heptachlorodibenzofuran	678HPF				see TCDD	see TCDD	see TCDD
1,2,3,4,7,8,9-Heptachlorodibenzofuran	789HPF				see TCDD	see TCDD	see TCDD
1,2,3,4,7,8,9-Heptachlorodibenzofuran	789HPF				see TCDD	see TCDD	see TCDD
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	678HXD				see TCDD	see TCDD	see TCDD
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	678HXD				see TCDD	see TCDD	see TCDD
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	789HXD				see TCDD	see TCDD	see TCDD
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	789HXD				see TCDD	see TCDD	see TCDD
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	78HXDD				see TCDD	see TCDD	see TCDD
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	78HXDD				see TCDD	see TCDD	see TCDD
2,3,4,6,7,8-Hexachlorodibenzofuran	234HXF				see TCDD	see TCDD	see TCDD
2,3,4,6,7,8-Hexachlorodibenzofuran	234HXF				see TCDD	see TCDD	see TCDD
1,2,3,6,7,8-Hexachlorodibenzofuran	678HXF				see TCDD	see TCDD	see TCDD
1,2,3,6,7,8-Hexachlorodibenzofuran	678HXF				see TCDD	see TCDD	see TCDD
1,2,3,4,7,8-Hexachlorodibenzofuran	78HXDF				see TCDD	see TCDD	see TCDD
1,2,3,4,7,8-Hexachlorodibenzofuran	78HXDF				see TCDD	see TCDD	see TCDD
Indeno(1,2,3-cd) Pyrene	ICDPYR				see Benzo(a)pyrene	see Benzo(a)pyrene	see TCDD
Iron	FE	Bird	390	NA	Assumed based on nutritional requirements of 2.4-3.9 mg/kg bw/day (Wiseman, 1987).		Need to remain above nutritional requirements or UF&toxicology methods become invalid and indefensible.
Iron	FE	Rat	19.55	NA	230 ppm in basal diet of controls. Convert with 0.085 g/g bw/d from Groton et al., 1991.	Schlicker and Cox, 1968	Use this as pertains to real data, not assumptions. Less uncertain.
Iron	FE	Dog	260	NA	Assumed based on nutrient requirement of 2.6 mg/kg bw/d.	NAS, 1974b	
Iron	FE	Duck	2.36	NA	Nutritional requirement	Wiseman, 1987	
Iron	FE	Chicken	3.88	NA	Nutritional requirement	Wiseman, 1987	
Lead	PB	Kestrel	14.5	NA	NOAEL (for survival, growth) from diet of 50 ppm (25 mg/kg bw/d) converted with 0.29 kg diet/kg bw (kestrel)(EPA, 1993b). A NOAEL of 14.5 mg/kg for survival, histopathology and reproduction also reported.	Franson et al., 1983; Pattee, 1984; Hoffman et al., 1985	Study concerns assessment endpoint receptor or closely related species
Lead (acetate)	PB	Chicken	9.7	NA	Dietary level of 100 ppm lead acetate tolerated, 8 wk study, 0.097 g/g bw/d (Wiseman, 1987) used to convert.	Ammerman et al., 1973	
Lead	PB	Mice and rats	NA	6.5	LOAEL of 25 mg/kg diet lead salts. Caused impaired reproduction. Converted with 0.26 kg diet/kg bw (EPA, 1993).	Venugopal and Luckey, 1978	

Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
Lead (acetate)	PBORG	Rat	11.985	170	Females on 2000 ppm had higher mortality than controls; males on 500 and 2000, but not 1000 ppm diet had higher mortality. Controls high mortality over 2 year study. Uses 141 ppm as NOAEL, 2000 as LOAEL. Use 0.085 g/g/d, Groton et al., 1991 to convert.	Azar et al., 1973	Primary reference, long term study. Rodents may be more sensitive than canids, so use this instead of dog study.
Lead (acetate)	PBORG	Dog	79	NA	NOAEL for appearance, behavior, weight gain, mortality, or neurology for dogs on 500 ppm diet for 2 yr. Convert with ingestion rate of 0.158 g/g bw/d for red fox (EPA, 1993).	Azar et al., 1973	
Lead	PB	Grazer	1.2	NA	Maximum tolerated in diet 30 ppm, dwb. Convert with 0.04 kg diet/kg bw (Sax, 1984).	Bodek et al., 1988	
Manganese	MN	Bird	410	NA	Assumed based on nutritional requirements of 6.8 and 4.13 for chickens and ducks (Wiseman, 1987)		Need to remain above nutritional requirements or UF&toxicology methods become invalid and indefensible.
Manganese	MN	Rat	1	NA	NEL for 60 day exposure for behavior and gross pathology in growing rats. Microscopic degeneration observed.	Friberg et al., 1979	
Manganese	MN	Rat	5200	52000	NEL was 20,000 ppm for 28 day exposure for weight, histology. Microscopic degeneration observed. Converted with 0.26 kg/kg bw/d for mice from EPA, 1993. LEL was 200,000 ppm.	Friberg et al., 1979	
Manganese	MN	Rat, mouse	200	615	NOAEL for mortality for chronic exposure; 615 the LOAEL for mortality. NOAEL for mice 160-200.	NTP, 1993	Most recent study; well conducted. Earlier studies gave highly discrepant results.
Manganese	MN	Grazer	80	NA	Maximum chronic tolerated dietary level is 400 - 2000 ppm dwb (converted with 0.04 kg diet/kg bw (Sax, 1984))	Bodek et al., 1988	
2-Methylnapthalene	2MNAP				see Benzo(a)pyrene	see Benzo(a)pyrene	see BAP
Mercury	HG	Chicken	2.5	12.5	NOAEL for growth; 12.5 the LOAEL (convert with 0.097 kg diet/kg bw/day (Wiseman, 1987)). 12.5 mg/kg bw/d affects quail reproduction. 1.1 NEL for starling.	Thaxton et al., 1975; Thaxton and Parkhurst, 1973; Nicholson and Osborn, 1984.	Only inorganic avian value. Don't expect methyl mercury under oxidated, dry conditions.
Mercury (organic)	HG	pheasant	NA	0.25	LOAEL for reproductive effects in a 350 d study with organic mercury. This was a NOAEL for mortality.	Spann et al., 1972	
Mercury (organic)	HG	Mallard	0.0315	0.189	Study with 3 generations fed 0.5 and 3 ppm methyl mercury in diet. NEL for body weight, mortality was 0.5 ppm. Convert with 0.063 kg/kg bw/d EPA, 1993b. LOAEL 3 ppm for hatchling survival decrease 10%.	Heinz, 1976	

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Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
Mercury (organic)	HG	Black duck	NA	0.189	Diet of 3 ppm methyl mercury over 2 yr. period reduced reproductive success. Convert with 0.063 kg/kg bw/d EPA, 1993.	Finley and Stendall, 1978	
Mercury (organic)	HG	Red-tailed hawk	0.3861	0.7128	No mortality (NEL) during 12 week study at 3.9 ppm methyl mercury in diet. Mortality (LEL) at 7.2 ppm. Converted with 0.099 kg diet/kg bw/d from EPA, 1993b.	Fimreite and Karsted, 1971	
Mercury (organic)	HG	Rat	0.56	2.2	NOAEL for 2 yr. study with organic mercury. 2.2 mg/kg bw/d the LOAEL for growth, mortality.	Fitzhugh et al., 1950	
Mercury	HG	Rat	14	NA	NOAEL for 2 yr. study with inorganic mercury for reproduction, development. No LOAEL.	Fitzhugh et al., 1950	
Mercury	HG	Mouse	NA	3.9	Increased morbidity. Converted from 15 ppm in diet with 0.26 kg diet/kg bw/d (EPA, 1993).	Mitsumori et al., 1981	Mice may be more sensitive than rats as indicated by Fitzhugh rat value. This species related to receptor species.
Mercury	HG	Mink	0.75	NA	NOAEL	Aulerich et al., 1974	
Methoxychlor	MEXCLR	Mallard, sharp-tailed grouse, California quail	NA	2000	LD50 exceeded 2,000 mg/kg bw for all species.	Hudson et al., 1984	Only value
Naphthalene	NAP				see Benzo(a)pyrene	see Benzo(a)pyrene	see Benzo(a)pyrene
Nickel	NI	Chicken	NA	87.3	900 LEL for growth inhibition (estimated from 900 ppm diet and 0.097 kg/kg bw/d from Wiseman, 1987). 1,000 ppm a NEL in other studies.	Venugopal and Luckey, 1978.	Only avian value.
Nickel	NI	Rat	NA	158	TDlo for multigeneration study for effects on embryo or fetus.	RTECs, 1996	Study concerns assessment endpoint.
Nickel	NI	Rat	24.15	NA	NOAEL for reproduction.	Opresko et al., 1993	
Nickel	NI	Cat, dog	12	NA	NEL for 200 day study.	Venugopal and Luckey, 1978	
Nitrate, nitrite-nonspecific	NIT	NA	NA	NA	NA		
Nitrate	NO3	NA	NA	NA	NA		
Nitrite	NO2	NA	NA	NA	NA		
Nitrobenzene	NB	Mouse	NA	4.5	LOAEL (hematology; adrenal, renal, hepatic lesions), chronic. Derived from inhalation study.	IRIS	Only value
N-Nitrosodiphenyl amine	NNDPA	Rat	4000	NA	NOEL for survival, derived from LOAEL for carcinomas and cutaneous fibromass.	HSDB	Only value
Octachlorodibenzo dioxin	OCDD				See TCDD	See TCDD	See TCDD
Octachlorodibenzo dioxin	OCDD				See TCDD	See TCDD	See TCDD
Octachlorodibenzo furan	OCDF				see TCDD	see TCDD	see TCDD
Octachlorodibenzo furan	OCDF				see TCDD	see TCDD	see TCDD
PCB-1248	PCB248	chicken	0.067	0.67	NOAEL for reproductive effects for 8 week study. LOAEL was 0.67 mg/kg bw/d.	Scott, 1977	Use PCB1254 for all PCBs

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Table 7-20. *Summary of Toxicity Information for Mammals and Birds (continued)*

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
PCB-1254	PCB254	Ring-necked pheasant	0.18	1.8	NOAEL for reproduction, 16 week study. LOAEL was 1.8 mg/kg bw/d.	Dahlgren et al., 1972	Longest avian study.
PCB-1254	PCB254	mallard	1.5	NA	NOAEL for reproduction, 1 month study. No LOAEL.	Custer and Heinz, 1980	
PCB-1254	PCB254	chicken	0.13	1.3	NOAEL for reproductive effects for 9 week study. LOAEL was 1.3 mg/kg bw/d.	Lillie et al., 1974	
PCB-1254	PCB254	mouse	NA	1.7	LOAEL for reproductive effects in a 2 generation study.	Linzey, 1988	Longest mammalian study.
PCB-1254	PCB254	Mink	0.07	NA	NOAEL for reproduction	Opresko et al., 1993	
PCB-1260	PCB260				See PCB-1254 for birds	See PCB-1254	See PCB-1254
PCB-1260	PCB260				See PCB-1254 for mammals	See PCB-1254	See PCB-1254
2,3,4,7,8-Pentachlorodibenzofuran	234PCF				See TCDD	See TCDD	See TCDD
2,3,4,7,8-Pentachlorodibenzofuran	234PCF				See TCDD	See TCDD	See TCDD
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	78PCDD				See TCDD	See TCDD	See TCDD
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	78PCDD				See TCDD	See TCDD	See TCDD
1,2,3,7,8-Pentachlorodibenzofuran	78PCDF				See TCDD	See TCDD	See TCDD
1,2,3,7,8-Pentachlorodibenzofuran	78PCDF				See TCDD	See TCDD	See TCDD
Pentaerythritol tetranitrate (PETN)	PETN	NA	NA	NA	NA	NA	
Phenanthrene	PHANTR				see Benzo(a)pyrene	see Benzo(a)pyrene	see BAP
Phenol	PHENOL	Rat	60	NA	NOAEL, chronic, oral study demonstrating decreased fetal weight.	IRIS	
Phosphate	PO4	NA	NA	NA	NA	NA	
ppDDD	PPDDD				See DDT for birds	see DDT	See DDT
ppDDD	PPDDD				See DDT for mammals	see DDT	See DDT
ppDDE	PPDDE	barn owl	NA	3	LEL for eggshell thickness, embryo mortality, reproductive success.	Mendenhall et al., 1983	
ppDDE	PPDDE				See DDT for mammals	see DDT	See DDT
ppDDT	PPDDT	quail	NA	0.25	LOAEL for 26 week study for reproductive success. Other data indicate 1 a NOAEL and 2.5 mg/kg bw/d a LOAEL for quail for reproduction and mortality.	Davison et al., 1976; Stickel and Rhodes, 1970	
ppDDT	PPDDT	mallard	0.12	1.2	NOAEL for eggshell thinning, 11 month study. LOAEL was 1.2.	Davison and Sell, 1974	
ppDDT	PPDDT	kestrel	0.11	1.1	NOAEL for 5.5 month study for eggshell thinning. LOAEL was 1.1 mg/kg bw/d.	Lincer, 1972	
ppDDT	PPDDT	bald eagle	0.3	3	NOAEL for mortality for 112 day study. The LOAEL was 3 mg/kg bw/d.	Chura and Stewart, 1967; Stickel et al., 1966	Appropriate for assessment endpoint. Lower than DDE owl study; results similar to DDT kestrel, mallard study.
ppDDT	PPDDT	brown pelican	NA	0.027	Chronic LOAEL for reproduction; value is for DDT and metabolites. UF as per EPA, 1995.	Anderson et al., 1975	
ppDDT	PPDDT	rat	NA	14.5	LOEL for decreased lipid by 30%, increased liver weight by 20% due to hypertrophy	Newell et al., 1987	

Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
ppDDT	PPDDT	mouse	8.5	43	NOAEL for mortality, longevity for chronic study. LOAEL was 43 mg/kg wb/day.	Turasov et al., 1973	Chronic study; recent data (relatively), appropriate endpoints to address assessment endpoints. Rat study endpoints not clearly related to adverse population effects as lipids fluctuate seasonally; hypertrophy doesn't necessarily effect survival or repro.
ppDDT	PPDDT	rat	0.8	4.0	NOAEL for reproductive effects for chronic study. 4.0 mg/kg bw/day the LOAEL. Suspect study due to antiquated analytical techniques.	Fitzhugh, 1948	Old study; suspect chemical methodology!
ppDDT	PPDDT	short-tailed shrew	NA	1745.12	14-day LC50 ranged from 839 to greater than 2552 ppm diet. Shrews fed 25-30 g diet per day/14.4 to 21.3 g bw; dietary ingestion rate 1.17 -2.08 g/g bw/d.	Blus, 1978	
Pyrene	PYR				see BAP	see BAP	see BAP
RDX (Cyclonite)	RDX	Rat	1	NA	NOAEL, 30 day, subchronic oral exposure	MacPhail et al., 1985	Only value
Selenium	SE	Chicken	0.66	NA	NOAEL for egg production and egg weight, although slight decrease in hatchability.	Ort and Latshaw, 1978	Appropriate endpoint. Must remain above required nutrient level.
Selenium	SE	Chicken	0.485	NA	Threshold for diet of 5 ppm for farm animals and poultry for effects on growth, survival. Convert with 0.097 kg diet/kg bw/d from Wiseman, 1987.	Friberg et al., 1979	
Selenium	SE	Chicken	0.0097	NA	Required as nutrient.	Wiseman, 1987	
Selenium	SE	Mallard	0.252	1.008	16 ppm diet decreased hatching success in 100 d study. 8 ppm increased malformed embryos. 4 ppm diet NOAEL. Convert w/ 0.063 g/g bw/d from EPA, 1993.	Heinz et al., 1989	
Selenium	SE	Mallard	NA	0.945	NEL for 21 week study for mortality is 15 ppm in diet; this will cause reproductive problems. 100 ppm in diet lethal. Convert with 0.063 kg diet/kg bw/day from EPA, 1993b. 40 ppm in diet lethal to ducklings.	Heinz, 1993; Heinz et al., 1988	
Selenium	SE	Livestock	0.2	NA	Threshold for diet of 5 ppm for farm animals and poultry for effects on growth, survival. Convert with 0.04 kg diet/kg bw/d from Sax, 1984.	Friberg et al., 1979	
Selenium	SE	Rat	1.248	1.664	Diet of 4.8 ppm NEL for blood chemistry, growth, histopathology for 6 week study. LEL was 6.4 ppm. Convert with 0.26 kg/kg bw/d from EPA, 1993 for mice.	Friberg et al., 1979	

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Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
Selenium	SE	Mouse	NA	0.57	LOAEL for reproductive effects	Opresko et al., 1993	Appropriate endpoint. Must remain above required nutrient level.
Selenium	SE	Grazer	0.08	NA	Maximum tolerated in diet is 2 ppm dwb (convert with 0.04 kg diet/kg bw (Sax, 1984)).	Bodek et al., 1988	
Selenium	SE	Dog	0.004	NA	Nutritional requirement	NAS, 1974b	
Silver	AG	Turkey	NA	87.3	LEL for cardiac effects and 28.6% mortality for 18 week study with 900 ppm. Convert with 0.097 kg/kg bw/d from Wiseman, 1987.	Friberg et al., 1979	Only avian value.
Silver	AG	Rat	65	NA	NOAEL for 12 week study.	Walker, 1971	
Silver	AG	Pig	68	NA	NOAEL for overt toxicity and growth depression. Fed diet with 2% silver acetate, converted with 0.034 kg/kg bw/d (Wiseman, 1987)	Van Vleet, 1976	Appropriate endpoints. Both mammalian studies have consistent results.
Sulfate	SO4	NA	NA	NA	NA		
2,3,7,8-Tetrachlorodibenzo-p-dioxin	TCDD	Chicken	1.00E-04	NA	NOAEL (for mortality within 21 days in 3-d old chickens, 100 pg/g bw/d)	Schwetz et al., 1973	
2,3,7,8-Tetrachlorodibenzo-p-dioxin	TCDD	Rat	1.00E-06	NA	NOAEL (for decreased fertility, 1 pg/g bw/d)	Murray et al., 1979	
2,3,7,8-Tetrachlorodibenzofuran	TCDF				see TCDD	see TCDD	See TCDD
2,3,7,8-Tetrachlorodibenzofuran	TCDF				see TCDD	see TCDD	See TCDD
Tetrachloroethylene	TCLEE	Rat	14	NA	90-day NOEL for weight gain.	CEPA, 1993e	
Tetrachloroethylene	TCLEE	Rat	NA	1067.8	LOAEL for chronic inhalation study. Decreased survival and caused cellular changes. Converted with rate of 0.126 m3/d from allometric equation (EPA, 1993) and assumed body weight of 0.16 kg.)	CEPA, 1993e	
Tetrachloroethylene	TCLEE	Mouse	NA	20	LOAEL for hepatic damage.	CEPA, 1993e	Avoid extrapolating from inhal. when possible. This or oral rat study ok; rat better since have duration and NOEL for nonlethal effect.
Thallium	TL	Ring-necked pheasant	NA	23.7	LD50	Hudson et al., 1984	Only avian value.
Thallium	TL	Rodent	NA	15.8	LD50 range from 15.8 - 43.6 mg/kg bw/d.	Jorgensen et al., 1991	
Thallium	TL	Mammals	NA	5	LD50 ranges from 5 - 70 mg/kg bw.	Friberg et al., 1979	
Thallium	TL	Mouse	NA	6	Mice gavaged on gestational days 6-15 had postimplantation fetal loss and slight decrease in birth weight.	Roll and Matthiaschk, 1981	
Thallium	TL	Rat	NA	3	Rats gavaged on gestational days 6-15 had slight increase in postimplantation fetal loss.	Roll and Matthiaschk, 1981	Best study. Avoid drinking water exposure, repro. endpoint more sensitive than mortality one.

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Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
Thallium	TL	Rat	NA	5.70	Rats treated for 6 months lost hair, had ultrastructural changes in muscle tissue from Tl-acetate.	Deshimaru et al., 1977	
Thallium	TL	Rat	0.25	NA	In 90-d study with oral gavage, NOAEL was 0.25 mg/kg bw/d for weight, food intake, hematology, clinical chemistry, neurology, and histopathology. No LOAEL as this was highest dose.	EPA, 1986	
Thallium	TL	Rat	NA	1.4	After treatment for 36 wk w/ Tl in drinking water, mortality was 21%.	Manzo et al., 1983	
Thallium	TL	Rat	1.275	2.55	Fed acetate and oxide forms for 15 wks; 30 ppm lethal to 100%. Mortality in 15 ppm treatment similar to controls. Use 15 ppm as NOAEL, 30 ppm as LOAEL. Use 0.085 g/g/d from Groton et al., 1991 to convert.	Downs et al., 1960	
Toluene	MEC6H5	NA	NA	NA	NA	NA	
Total hexachlorodibenzo-p-dioxins	THCDD				see TCDD	see TCDD	see TCDD
Total hexachlorodibenzo-p-dioxins	THCDD				see TCDD	see TCDD	see TCDD
Total hexachlorodibenzofurans	THCDF				see TCDD	see TCDD	see TCDD
Total hexachlorodibenzofurans	THCDF				see TCDD	see TCDD	see TCDD
Total heptachlorodibenzo-p-dioxins	THPCDD				see TCDD	see TCDD	see TCDD
Total heptachlorodibenzo-p-dioxins	THPCDD				see TCDD	see TCDD	see TCDD
Total heptachlorodibenzo furans	THPCDF				see TCDD	see TCDD	see TCDD
Total heptachlorodibenzofurans	THPCDF				see TCDD	see TCDD	see TCDD
Total pentachlorodibenzo-p-dioxins	TPCDD				see TCDD	see TCDD	see TCDD
Total pentachlorodibenzo-p-dioxins	TPCDD				see TCDD	see TCDD	see TCDD
Total pentachlorodibenzofurans	TPCDF				see TCDD	see TCDD	see TCDD
Total pentachlorodibenzofurans	TPCDF				see TCDD	see TCDD	see TCDD
Total petroleum hydrocarbons	TPHC	mallard	126	1260	NOAEL of 20,000 ppm diet, 22 week study for mortality, body weight, food consumption, reproduction & hatching success. This was a LOAEL for serum chemistry, eggshell thickness. Converted with 0.063 kg/kg bw/d (EPA, 1993). 2000 ppm a NOAEL, all effects.	Stubblefield et al., 1995a	Only avian value.
Total petroleum hydrocarbons	TPHC	ferret	5000	NA	5 day NOAEL for serum chemistry. Minor effects noted were increased serum albumin, decreased spleen weight in treated females.	Stubblefield et al., 1995b	Less overall uncertainty than mouse study. Repeated dosing.
Total petroleum hydrocarbons	TPHC	mouse	NA	16000	LD50 range for three crude oils exceeded highest test doses of >10 - 16 g/kg bw.	Smith et al., 1980	
Total phosphates	TPO4	NA	NA	NA	NA		
Total tetrachlorodibenzo-p-dioxins	TTCDD				see TCDD	see TCDD	see TCDD
Total tetrachlorodibenzo-p-dioxins	TTCDD				see TCDD	see TCDD	see TCDD
Total tetrachlorodibenzofurans	TTCDF				see TCDD	see TCDD	see TCDD
Total tetrachlorodibenzofurans	TTCDF				see TCDD	see TCDD	see TCDD

Table 7-20. *Summary of Toxicity Information for Mammals and Birds (continued)*

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
1,1,1-Trichloroethane	111TCE	Rabbit, guinea pig, rat	NA	5700	LD50	Jorgensen et al., 1991	Only value
Trichloroethylene	TRCLE	Mouse	NA	100	Increased liver weight in 6 week oral study.	CEPA, 1993f	Best study based on applicable exposure route.
Trichloroethylene	TRCLE	Mouse,rat, gerbil	NA	157	Increased liver weight, altered enzyme level, 200 mg/m3 converted with 0.126 m3/d from allometric equation (EPA, 1993) and assumed body weight of 0.16 kg.	CEPA, 1993f	
Trichloroethylene	TRCLE	Mouse	NA	393	Alter urinary and hematological parameters in 4-6 month study from drinking water ingestion of 2500 mg/L.	CEPA, 1993f	
1,3,5-Trinitrobenzene	135TNB				NA		
2,4,6-Trinitrotoluene	246TNT	Rat	0.4	2	NOAEL for effects on spleen, liver, kidney, chronic lifetime test. Altered hematology in 2 mg/kg dose in 31.5% of the tested females.	Furedi et al., 1984a	
2,4,6-Trinitrotoluene	246TNT	Mouse	3	NA	NOAEL for chronic lifetime study for body weight and other effects.	Furedi et al., 1984a	
2,4,6-Trinitrotoluene	246TNT	Dog	0.5	8	NOAEL for lethality, food consumption for 26 wk study; did cause mild liver histopathological effects. One animal at 2 mg/kg bw/d had microscopic cirrhosis and hemosiderosis of the liver.	Levine et al., 1983	Lower overall uncertainty. Similar value to rat.
Vanadium	V	Ruminant	0.53	NA	Tolerated by young ruminants.	Venugopal and Luckey, 1978.	
Vanadium	V	Cow	NA	20	20 mg/kg bw toxic within 3 days of administration for calves.	Platonow and Abbey, 1968	
Vanadium	V	Sheep	NA	40	Limited study with few animals indicated 9.7 - 11.2 mg/kg bw toxic as defined by 75% decrease in feed intake. Alter dose during test. 40 mg/kg bw, single dose, was lethal to 2/3 sheep.	Hansard et al., 1982	Best study. Rat & guinea pig endpoints a reach to population effects.
Vanadium	V	Guinea pig	0.128	5.12	Brain enzyme activity reduced at 5.12 mg/kg /day; NEL was 0.128 mg/kg/d for 10-15 days. Not a clear population effect.	Friberg et al., 1979	
Vanadium	V	Rat	NA	0.05	LEL for reflexes for 80 day feeding of aqueous solution 0.05-0.5 mg V/kg bw/d.	Friberg et al., 1979	
Xylenes	XYLEN	Rat	250	500	NOAEL, short term study (body weight, survival, hepatic). Converted with body weight of 0.16 kg, inhalation rate of 0.126 m3/d (EPA, 1993)	CEPA, 1993c	More information available for study. Mouse ok if primary citation found.
Xylenes	XYLEN	Mouse	1000	NA	NOAEL.	CEPA, 1993f	
m-Xylene	13DMB				see Xylenes	see Xylenes	see Xylenes
Zinc	ZN	Bird	23	NA	Assumed based on nutritional requirements of 2.4-8.0 mg/kg bw/day for quail, ducks, chicken.	Wiseman, 1987	

Table 7-20. Summary of Toxicity Information for Mammals and Birds (continued)

Analyte	Analtye Code	Species	NOAEL (mg/kg bw/d)	LOAEL (mg/kg bw/d)	Study Description	Reference	Comment
Zinc	ZN	Mallard	NA	189	Ducks fed 3000 ppm in diet had decreased gonad size, probably impairment of function. Overt toxicity after 20 days. Mortality high by 60 days. Convert with 0.063 g/g/d, EPA, 1993.	Gasaway and Buss, 1972	Appropriate endpoint, long study.
Zinc	ZN	Chicken	97	145.5	Tolerate 1000 ppm in feed, but 1500 and above decreased growth. Carbonate >sulfate>oxide in toxicity. Convert w/ 0.097 g/g/d from Wiseman, 1987.	Roberson and Schaible, 1960	
Zinc	ZN	Chicken	291	485	Minimal mortality (15%) at 10 wks on diet with 5000 ppm. Mortality was 2.5% for 3000 ppm treatment; use this as NOAEL. Convert with 0.097 g/g/d from Wiseman, 1987.	Johnson et al., 1962	
Zinc	ZN	Mouse	NA	100	500 mg/L in drinking water causes histopathological changes. Convert with 0.2 L/kg bw/day from EPA, 1993. Use low UF because no direct link with population effects.	Friberg et al., 1979	
Zinc	ZN	Rat	170	340	0.2% in diet NOAEL for effects on fetus. 0.4% had reproductive effects. Study ranged from 16 to 40 days. Convert with 0.085 kg/kg bw/d from Groton et al., 1991.	Schlicker and Cox, 1968	
Zinc	ZN	Rat	NA	850	1% in diet toxic to rats (850 mg/kg bw/d converted with 0.085 kg/kg bw/d from Groton et al., 1991).	Lewis et al., 1957	
Zinc	ZN	Pig	34	NA	NOAEL based on 1000 ppm diet and ingestion rate of 0.034 kg/kg bw/d (Wiseman, 1987). Duration of study 14 - 17 wks.	Sutton and Nelson, 1937	Long term study; least uncertainty in toxicology, although study old, question analytical.
Zinc	ZN	Grazer	40	NA	Maximum tolerated in diet 300-1000 ppm, dwb.	Bodek et al., 1988	
Zinc	ZN	Sheep	5	NA	No adverse effect on development of fetus when given to ewes during gestation.	James et al., 1966	

[a]No observed adverse effects level.
[b]Milligrams per kilogram, body weight per day.
[c]Lowest observed adverse effects level.
[d]Not available.
[e]Benzo(a)pyrene.
[f]Rocky Mountain Arsenal
[g]U.S. Environmental Protection Agency.
[h]No effects level.
[i]Parts per million.
[j]Grams per gram per day.
[k]Milligrams per liter.
[l]Dry weight basis.
[m]No observed effects level.
[n]Lowest observed effects level.
[o]Cubic meters per day.
[p]Lethal dose 50 percent.
[q]With.
[r]Without.
[s]Lowest effects level.
[t]Toxic dose low.
[u]50 percent lethal concentration.

Table 7-21. Toxicity Benchmark Values for Plants and Soil Fauna

Analyte	Analyte Code	Species	TBV (mg/kg)	Endpoint Description	Reference	Comment
Acenaphthene	ANAPNE	Lettuce	25	EC50 for inhibition of growth relative to control for 14 d study	Hulzebos et al., 1993	Primary reference
Acenaphthene	ANAPNE	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
alpha-Chlordane	ACLDAN	NA	NA	NA	NA	NA
Aluminum	AL	Wheat	730	At soil pH <5, relative root length decreased 80% that of controls. Expected to be less toxic in neutral, alkaline soils.	Wright et al., 1989	Primary reference. Receptor related to site receptors.
Aluminum	AL	woodlouse	2800	55 - 75% survival over 6 - 12 weeks at 2500 - 2800 mg/kg soil	ICF, 1989	Only value
Anthracene	ANTRC	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Anthracene	ANTRC	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Antimony	SB	Plants	5	recommended benchmark value	Suter et al., 1995	Only value
Arsenic	AS	Plants	10	Recommended benchmark value. AsV at this concentration may suppress growth in some species; AsIII suppresses growth at 25 mg/kg.	Suter et al., 1995; CEPA, 1993	Toxicity data consistent between studies.
Arsenic	AS	Earthworms	60	recommended benchmark value	Suter et al, 1995	
Barium	BA	Plants	500	recommended benchmark value	Suter et al., 1995	Only value
Benzo(a)anthracene	BAANTR	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Benzo(a)anthracene	BAANTR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Benzo(a)pyrene	BAPYR	Corn, soya, wheat	50	Stimulates growth. Levels above this inhibit growth.	CEPA, 1994a	Only BAP plant value
Benzo(a)pyrene	BAPYR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Benzo(b)fluoranthene	BBFANT	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Benzo(b)fluoranthene	BBFANT	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Benzo(ghi)perylene	BGHIPY	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Benzo(ghi)perylene	BGHIPY	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Benzo(k)fluoranthene	BKFANT	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Benzo(k)fluoranthene	BKFANT	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Beryllium	BE	Barley	10	Decreased yield by 26% in sandy soil; expect less response under alkaline conditions.	WHO 1990b	Data consistent.
Bis(2-ethylhexyl) phthalate	B2EHP	Spinach, pea	100	NEL	WHO, 1992a	Other studies provide test concentrations with effects
Butylbenzyl phthalate	BBZP	Spinach, pea	100	Use B2EHP	Use B2EHP	Use B2EHP
Cadmium	CD	Plants	3	recommended benchmark value	Suter et al, 1995	
Cadmium	CD	Earthworms	20	threshold for adverse effects on growth and sexual maturation	ICF, 1989	Less uncertainty in estimate.
Chloromethane	CH3CL	NA	NA	NA	NA	NA
Chloroform	CHCL3	NA	NA	NA	NA	NA
Chlordane	CLDAN	NA	NA	NA	NA	NA
Chromium (III)	CR	Orange	75	NEL; 150 ppm in soil phytotoxic.	NAS 1974a	Data indicate plants require at least 5 ppm, but 150 ppm toxic. Use this as NEL.
Chromium	CR	Earthworms	0.4	recommended benchmark value	Suter et al, 1995	
Chrysene	CHRY	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Chrysene	CHRY	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Cobalt	CO	Plants	20	recommended benchmark value	Suter et al., 1995	Data indicate 75 ppm in soil phytotoxic.
Copper	CU	Plants	100	phytotoxic level in soils	ICF, 1989	Lower values may cause deficiency. Possibly higher values suitable.
Copper	CU	Isopods	83.8	NEL for adverse effects on population although individual effects (fewer gravid females, decreased size) observed.	Donker et al., 1993	Data consistent in that 60-84 ppm NEL; levels above 400 alter function. This endpoint closest to assessment endpoints.

Table 7-21. Toxicity Benchmark Values for Plants and Soil Fauna (continued)

Analyte	Analyte Code	Species	TBV (mg/kg)	Endpoint Description	Reference	Comment
Cyclotetramethylenetetranitramine	HMX	NA	NA	NA	NA	
delta-BHC	DBHC	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	DBAHA	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Dibenzo(a,h)anthracene	DBAHA	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Dibenzofuran	DBZFUR	NA	NA	NA	NA	
Dichlorobenzene-nonspecific	DCLB	NA	NA	NA	NA	
Di-n-butyl phthalate	DNBP	Plants	200	recommended benchmark value	Suter et al, 1995	
Di-n-octyl phthalate	DNOP	Plants	NA	NA	NA	
Di-n-octyl phthalate	DNOP	Soil fauna	NA	NA	NA	
1,2-Dichlorobenzene	12DCLB	NA	NA	NA	NA	
1,3-Dichlorobenzene	13DCLB	NA	NA	NA	NA	
1,4-Dichlorobenzene	14DCLB	NA	NA	NA	NA	
2,4-Dichlorophenoxy acetic acid	24D	NA	NA	NA	NA	
Dieldrin	DLDRN	Earthworm	50	NOEC for growth or sexual maturation	ICF, 1989	
Dimethyl phthalate	DMP	Spinach, pea	100	Use B2EHP	Use B2EHP	Use B2EHP
2,4 Dinitrotoluene	24DNT	Lettuce	1000	EC50 for inhibition of growth relative to control >1000 mg/kg for 14 day study	Hulzebos et al., 1993	
Endosulfan II	BENSLF	NA	NA	NA	NA	
Endrin	ENDRN	NA	NA	NA	NA	
Endrin Aldehyde	ENDRNA	NA	NA	NA	NA	
Ethylbenzene	ETC6H5	NA	NA	NA	NA	
Fluoranthene	FANT	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Fluoranthene	FANT	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Fluorene	FLRENE	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Fluorene	FLRENE	Earthworm	173	LC50	ICF, 1989	
Fluoride	F	NA	NA	NA	NA	
gamma-BHC (Lindane)	LIN	NA	NA	NA	NA	
gamma-Chlordane	GCLDAN	NA	NA	NA	NA	
Heptachlor	HPCL	NA	NA	NA	NA	
Heptachlor Epoxide	HPCLE	NA	NA	NA	NA	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	678HPD	NA	NA	NA	NA	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	678HPF	NA	NA	NA	NA	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	789HPF	NA	NA	NA	NA	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	789HXD	NA	NA	NA	NA	
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	78HXDD	NA	NA	NA	NA	
2,3,4,6,7,8-Hexachlorodibenzofuran	234HXF	NA	NA	NA	NA	
1,2,3,6,7,8-Hexachlorodibenzofuran	678HXF	NA	NA	NA	NA	
1,2,3,4,7,8-Hexachlorodibenzofuran	78HXDF	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	ICDPYR	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Indeno(1,2,3-cd)pyrene	ICDPYR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Iron	FE	Plants	NA	Iron limiting under alkaline conditions.	Mortvedt 1991	
Iron	FE	Woodlice species	1000	significant increase in respiratory rate	ICF, 1989	
Lead	PB	Plants	494	phytotoxicity of soils is probable above this level	EPA, 1992	Median from data summarized by EPA, 1992

Table 7-21. *Toxicity Benchmark Values for Plants and Soil Fauna (continued)*

Analyte	Analyte Code	Species	TBV (mg/kg)	Endpoint Description	Reference	Comment
Lead	PB	Isopods	606	NEL for adverse effects on population although individual effects (fewer gravid females, decreased size) observed.	Donker et al., 1993	Primary reference; study endpoint is equivalent to assessment endpoint.
Manganese	MN	Plants	500	recommended benchmark value	Suter et al., 1995	Only value
2-Methylnapthalene	2MNAP	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
2-Methylnapthalene	2MNAP	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Mercury	HG	Plants	0.3	recommended benchmark value	Suter et al., 1995	
Mercury	HG	Earthworms	1	NEL for normal regeneration. LEL was 5 mg/kg.	Eisler, 1987	
Naphthalene	NAP	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Naphthalene	NAP	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Nickel	NI	Wheat	250	Decrease growth by 25% in calcareous soils. In acid soil, same effect at 110 mg/kg.	CEPA, 1994c	Test species similar to receptors; soils at site neutral to alkaline
Nickel	NI	Earthworms	200	recommended benchmark value	Suter et al, 1995	
Nitrate, nitrite-nonspecific	NIT	NA	NA	NA	NA	NA
Nitrate	NO3	NA	NA	NA	NA	NA
Nitrite	NO2	NA	NA	NA	NA	NA
Nitrobenzene	NB	NA	NA	NA	NA	NA
Nitrobenzene	NB	Earthworms	40	recommended benchmark value	Suter et al, 1995	
N-Nitrosodiphenylamine	NNDPA	NA	NA	NA	NA	NA
Octachlorodibenzodioxin	OCDD	NA	NA	NA	NA	NA
Octachlorodibenzofuran	OCDF	NA	NA	NA	NA	NA
PCB-1248	PCB248	Pigweed (P)	40	LOEC for biomass and height for PCBs	Suter et al., 1993	See PCB1254
PCB-1248	PCB248	Earthworm	240	LC50 in soil for 14-d laboratory bioassay.	Rhett et al., 1988	See PCB1254
PCB-1254	PCB254	Pigweed (P)	40	LOEC for biomass and height for PCBs	Suter et al., 1993	Only value
PCB-1254	PCB254	Earthworm	240	LC50 in soil for 14-d laboratory bioassay.	Rhett et al., 1988	Primary reference; seem more sensitive than crickets so conservative.
PCB-1260	PCB260	Pigweed (P)	40	LOEC for biomass and height for PCBs	Suter et al., 1993	See PCB1254
PCB-1260	PCB260	Earthworm	240	LC50 in soil for 14-d laboratory bioassay.	Rhett et al., 1988	See PCB1254
2,3,4,7,8-Pentachlorodibenzofuran	234PCF	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	78PCDD	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	78PCDF	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	PETN	NA	NA	NA	NA	NA
Phenanthrene	PHANTR	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Phenanthrene	PHANTR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Phenol	PHENOL	NA	NA	NA	NA	NA
Phenol	PHENOL	Earthworms	30	recommended benchmark value	Suter et al, 1995	
Phosphate	PO4	NA	NA	NA	NA	NA
ppDDD	PPDDD	Earthworm	200	95% mortality	Jorgensen et al., 1991	
ppDDE	PPDDE	Earthworm	200	95% mortality	Jorgensen et al., 1991	
ppDDT	PPDDT	Earthworm	200	95% mortality	Jorgensen et al., 1991	
Pyrene	PYR	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Pyrene	PYR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
RDX (Cyclonite)	RDX	NA	NA	NA	NA	NA
Selenium	SE	Wheat and buckwheat	1	decreased growth rate	ICF, 1989	Only value
Selenium	SE	Earthworms	70	recommended benchmark value	Suter et al, 1995	
Silver	AG	Plants	2	recommended benchmark value	Suter et al., 1995	Only value.

Table 7-21. Toxicity Benchmark Values for Plants and Soil Fauna (continued)

Analyte	Analyte Code	Species	TBV (mg/kg)	Endpoint Description	Reference	Comment
Sulfate	SO4	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin	TCDD	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	TCDF	NA	NA	NA	NA	NA
Tetrachloroethylene	TCLEE	NA	NA	NA	NA	NA
Thallium	TL	Plants	1	recommended benchmark value	Suter et al, 1995	
Thallium	TL	NA	NA	NA	NA	NA
Toluene	MEC6H5	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxins	THCDD	NA	NA	NA	NA	NA
Total hexachlorodibenzofurans	THCDF	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxins	THPCDD	NA	NA	NA	NA	NA
Total heptachlorodibenzofurans	THPCDF	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxins	TPCDD	NA	NA	NA	NA	NA
Total pentachlorodibenzofurans	TPCDF	NA	NA	NA	NA	NA
Total petroleum hydrocarbons	TPHC	NA	NA	NA	NA	NA
Total phosphates	TPO4	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxins	TTCDD	NA	NA	NA	NA	NA
Total tetrachlorodibenzofurans	TTCDF	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	111TCE	NA	NA	NA	NA	NA
Trichloroethylene	TRCLE	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene	135TNB	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	246TNT	Plants	2.1	May inhibit growth. Estimated from 0.5 mg/L in nutrient solution, where 0-24% appears in leachate and rest in soil.	CRREL 1990	Only value
Vanadium	V	Plants	2	recommended benchmark value	Suter et al., 1995	Only value
Xylenes	XYLEN	NA	NA	NA	NA	NA
m-Xylene	13DMB	NA	NA	NA	NA	NA
Zinc	ZN	Plants	50	recommended benchmark value	Suter et al., 1995	
Zinc	ZN	Earthworms	200	recommended benchmark value	Suter et al, 1995	

Note.-For acronym or abbreviation definitions, see Acronyms and Abbreviations list located behind Table of Contents.

Table 7-22. Uncertainty Factors (UFs) Used in the TEAD SWERA

Uncertainty Category	Duration/Endpoint	Uncertainty Factor
Intertaxon Extrapolation	Same class, different order	5
	Same order, different family	4
	Same family, different genus	3
	Same genus, different species	2
	Same species	1
	Special Status Species (includes Federal Threatened and Endangered (T&E) and State of Utah Sensitive species)	2
Study Duration	Acute (≤ 14 days)	10
	Subacute, subchronic (15-30 days)	5
	Duration > 30 days	1
Study Endpoint	LD50[a], LC50[b]	10
	TD_{LO}[c] for lethality	7
	TD_{LO} for nonlethal/sublethal effects	5
	NOAEL/NOEL[d] lethal *or* LOAEL/LOEL[e] for nonlethal	3
	NOAEL for nonlethal	1

Note.—Special Status Species UF used *in addition to* other Intertaxon Extrapolation UFs where applicable.
[a]50 percent lethal dose.
[b]50 percent lethal concentration.
[c]Toxic dose low.
[d]No observed adverse effects level/No observed effects level.
[e]Lowest observed adverse effects level/Lowest observed effects level.

Table 7-23. Application of Uncertainty Factors to Adjust for Intertaxon and Sensitive Species Uncertainty

Analyte	Group	Analtye Code	TBV adj (mg/kg bw/d)	Species	INTERTAXON/T&E UNCERTAINTY FACTORS PASS(a)	AK(b)	GHO(c)	GE(d)	BE(e)	DM(f)	MD(g)	JR(h)	KF(i)	MDK(j)	SB(k)	Reference	Comment
Acenaphthene	PAH	ANAPNE	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Acetone	VOL	ACET	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	PEST	ACLDAN	14.10	Bird	5	5	5	10	10	NA	NA	NA	NA	NA	NA	USEPA (Hudson et al., 1984)	Primary citation
alpha-Chlordane	PEST	ACLDAN	1.20	Mammals	NA	NA	NA	NA	NA	5	5	5	10	NA	NA	USEPA, 1984	Only value
Aluminum	M	AL	66.67	Lab animals	NA	NA	NA	NA	NA	4	5	4	10	NA	NA	Friberg et al., 1979	Growth common endpoint for Al toxicity. Less extrapolation to benchmark than other studies.
Anthracene	PAH	ANTRC	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Antimony	M	SB	0.59	rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Friberg et al., 1979	Clear endpoint, less vague than other
Arsenic	M	AS	14.00	Mallard	5	5	5	10	10	NA	NA	NA	NA	1	5	Camardese et al., 1990; Whitworth et al., 1991	Only value
Arsenic	M	AS	3.80	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Schroeder et al., 1968	Clear endpoint, less vague than other
Barium	M	BA	97.00	Chicken	5	5	5	10	10	NA	NA	NA	NA	5	5	Johnson et al., 1960	Only value
Barium	M	BA	11.87	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Perry et al., 1989	Only value
Benzo(a) Anthracene	PAH	BAANTR	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Benzo(a)pyrene	PAH	BAPYR	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Opresko et al., 1993	Use BAP for all PAHs
Benzo(b) fluoranthene	PAH	BBFANT	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Benzo(ghi)perylene	PAH	BGHIPY	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Benzo(k)fluoranthene	PAH	BKFANT	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Benzyl alcohol	VOL	BZALC	1.00	Bird	5	5	5	10	10	NA	NA	NA	NA	NA	NA	RTECS	Only value
Benzyl alcohol	VOL	BZALC	10.40	Rabbit	NA	NA	NA	NA	NA	5	5	2	10	NA	NA	RTECS	Only value
Beryllium	M	BE	97.00	Poultry	5	5	5	10	10	NA	NA	NA	NA	5	5	Friberg et al., 1979	Only value
Beryllium	M	BE	42.50	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	WHO, 1990b	Clear endpoint, less vague than other. Longterm study.
Bis(2-ethylhexyl) phthalate	PTHAL	B2EHP	10.40	Chicken	5	5	5	10	10	NA	NA	NA	NA	5	5	WHO, 1992	Clear endpoint; starling effect actually beneficial.
Bis(2-ethylhexyl) phthalate	PTHAL	B2EHP	102.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	WHO, 1992	Similar endpoints, select lowest value
Butylbenzyl phthalate	PTHAL	BBZP	10.40	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see B2EHP for birds	see B2EHP
Butylbenzyl phthalate	PTHAL	BBZP	102.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see B2EHP for mammals	see B2EHP
Cadmium	M	CD	0.67	Mallard	5	5	5	10	10	NA	NA	NA	NA	1	5	Cain et al., 1983; White and Finley, 1978	Only value
Cadmium	M	CD	2.50	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Groten et al., 1991	Clear endpoint. Fewer toxicity related UFs.
Chloromethane	VOL	CH3CL	NA	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	VOL	CHCL3	NA	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane	PEST	CLDAN	14.10	Bird	5	5	5	10	10	NA	NA	NA	NA	NA	NA	USEPA (Hudson et al., 1984)	See ACLDAN
Chlordane	PEST	CLDAN	1.20	Mammals	NA	NA	NA	NA	NA	5	5	5	10	NA	NA	USEPA, 1984	See ACLDAN
Chromium (III)	M	CR	1.28	Tern	5	5	5	10	10	NA	NA	NA	NA	5	4	CEPA, 1994b	Use this study as it concerns the assessment endpoints, for field based population

Table 7-23. Application of Uncertainty Factors to Adjust for Intertaxon and Sensitive Species Uncertainty (continued)

Analyte	Group	Analtye Code	TBV adj (mg/kg bw/d)	Species	PASS[a]	AK[b]	GHO[c]	GE[d]	BE[e]	DM[f]	MD[g]	JR[h]	KF[i]	MDK[j]	SB[k]	Reference	Comment
					INTERTAXON/T&E UNCERTAINTY FACTORS												
Chromium (III)	M	CR	20.00	Cat	NA	NA	NA	NA	NA	5	5	5	8	NA	NA	NAS, 1974a	Use this study since it was long term, in diet. Rat exposure by water could influence absorption.
Chromium (VI)	M	CRHEX	NA	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NA
Chrysene	PAH	CHRY	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see BAP	Use BAP for all PAHs
Cobalt	M	CO	840.00	Duck	5	5	5	10	10	NA	NA	NA	NA	2	5	EPA, 1993; Friberg et al., 1979 :DIR (g/gbw/d) =(0.495 Wt^(0.704))/BW	Only avian value
Cobalt	M	CO	0.24	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Domingo, 1994	Endpoint relates to assessment endpoint
Copper	M	CU	55.29	Chicken	5	5	5	10	10	NA	NA	NA	NA	5	5	Mehring et al., 1960	Primary citation
Copper	M	CU	7.87	Mink	NA	NA	NA	NA	NA	5	5	5	8	NA	NA	Aulerich et al., 1982	Since rat and pig study showed doses that were beneficial, UFs optional. If apply UFs, get dose below beneficial level.
Cyclotetramethylene tetranitramine	MUN	HMX	6.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Everett et al., 1985	Only value
Dibenzo(a,h)anthracene	PAH	DBAHA	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Dibenzofuran	SVOC	DBZFUR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorobenzene-nonspecific	VOL	DCLB	5.00	Mouse, rat	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	see 1,2 DCB	Use 12DCLB
Dibutyl phthalate	PTHAL	DNBP	10.40	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see B2EHP	see B2EHP
Dibutyl phthalate	PTHAL	DNBP	102.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see B2EHP	see B2EHP
Dioctyl phthalate	PTHAL	DNOP	10.40	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see B2EHP	see B2EHP
Dioctyl phthalate	PTHAL	DNOP	102.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see B2EHP	see B2EHP
1,2-Dichlorobenzene	VOL	12DCLB	5.00	Mouse, rat	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	CEPA, 1993a	Oral study. Rabbit value has more extrapolation since exposure was by inhalation.
1,3-Dichlorobenzene	VOL	13DCLB	5.00	Mouse, rat	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	Use 12DCLB	Use 12DCLB
1,4-Dichlorobenzene	VOL	14DCLB	5.00	Mouse, rat	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	Use 12DCLB	Use 12DCLB
2,4-Dichlorophenoxy acetic acid	PEST	24D	1.00	Dog	NA	NA	NA	NA	NA	5	5	5	6	NA	NA	Sax, 1992	Use this since lowest LD50; likely to protect kit fox.
Dieldrin	PEST	DLDRN	0.50	Barn owl	5	5	4	10	10	NA	NA	NA	NA	NA	NA	Mendenhall et al., 1983	Relates to assessment endpoint. More closely related to receptor, GHO.
Dieldrin	PEST	DLDRN	0.05	Dog	NA	NA	NA	NA	NA	5	5	5	6	NA	NA	Walker et al., 1969	Most appropriate endpoints for chronic studies.
Dimethyl phthalate	PTHAL	DMP	10.40	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see B2EHP for birds	see B2EHP
Dimethyl phthalate	PTHAL	DMP	102.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see B2EHP for mammals	see B2EHP
2,4 Dinitrotoluene	MUN	24DNT	0.30	Dog	NA	NA	NA	NA	NA	5	5	5	6	NA	NA	Lee et al., 1975	Most appropriate endpoints for chronic studies. Less extrapoloation to assessment endpoints.
Endosulfan II	PEST	BENSLF	0.31	Mallard	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see Endosulfan I	see Endosulfan I
Endrin	PEST	ENDRN	0.01	Mallard	5	5	5	10	10	NA	NA	NA	NA	NA	NA	Roylance et al., 1985	Longest avian study.
Endrin	PEST	ENDRN	1.81	Short-tailed shrew	NA	NA	NA	NA	NA	5	5	5	10	NA	NA	Blus, 1978	Only value
Endrin Aldehyde	PEST	ENDRNA	1.81	Short-tailed shrew	NA	NA	NA	NA	NA	5	5	5	10	NA	NA	see endrin	Use endrin.
Ethylbenzene	VOL	ETC6H5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	PAH	FANT	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see BAP	Use BAP for all PAHs
Fluorene	PAH	FLRENE	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see BAP	Use BAP for all PAHs
Fluoride	M	F	3.20	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	CEPA, 1993g	Clear endpoint for adverse effect. Lower doses beneficial or unclear effects.
gamma-BHC (Lindane)	PEST	LIN	0.32	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	Ritchey et al., 1972	Longest avian study.

Table 7-23. Application of Uncertainty Factors to Adjust for Intertaxon and Sensitive Species Uncertainty (continued)

Analyte	Group	Analtye Code	TBV adj (mg/kg bw/d)	Species	PASS[a]	AK[b]	GHO[c]	GE[d]	BE[e]	DM[f]	MD[g]	JR[h]	KF[i]	MDK[j]	SB[k]	Reference	Comment
					INTERTAXON/T&E UNCERTAINTY FACTORS												
Heptachlor	PEST	HPCL	0.32	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	Ritchey et al., 1972	Longest avian study.
Heptachlor Epoxide	PEST	HPCLE	0.32	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	See heptachlor	See heptachlor
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	DIOX	678HPD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	DIOX	678HPD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
1,2,3,4,6,7,8-Heptachlorodibenzo furan	DIOX	678HPF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
1,2,3,4,6,7,8-Heptachlorodibenzo furan	DIOX	678HPF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
1,2,3,4,7,8,9-Heptachlorodibenzo furan	DIOX	789HPF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
1,2,3,4,7,8,9-Heptachlorodibenzo furan	DIOX	789HPF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	DIOX	678HXD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	DIOX	678HXD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	DIOX	789HXD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	DIOX	789HXD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	DIOX	78HXDD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	DIOX	78HXDD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
2,3,4,6,7,8-Hexachlorodibenzo furan	DIOX	234HXF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
2,3,4,6,7,8-Hexachlorodibenzo furan	DIOX	234HXF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
1,2,3,6,7,8-Hexachlorodibenzo furan	DIOX	678HXF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
1,2,3,6,7,8-Hexachlorodibenzo furan	DIOX	678HXF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
1,2,3,4,7,8-Hexachlorodibenzo furan	DIOX	78HXDF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
1,2,3,4,7,8-Hexachlorodibenzo furan	DIOX	78HXDF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
Indeno(1,2,3-cd) Pyrene	PAH	ICDPYR	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Iron	M	FE	390.00	Bird	5	5	5	10	10	NA	NA	NA	NA	5	5	Wiseman, 1987	Need to remain above nutritional requirements or UF & toxicology methods become invalid and indefensible.
Iron	M	FE	19.55	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Schlicker and Cox, 1968	Use this as pertains to real data, not assumptions. Less uncertain.
Lead	M	PB	14.50	Kestrel	5	1	5	8	8	NA	NA	NA	NA	5	5	Franson et al., 1983; Pattee, 1984; Hoffman et al., 1985	Study concerns assessment endpoint receptor or closely related species
Lead (acetate)	M	PBORG	4.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Azar et al., 1973	Primary reference, long term study. Rodents may be more sensitive than canids, so use this instead of dog study.

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Table 7-23. *Application of Uncertainty Factors to Adjust for Intertaxon and Sensitive Species Uncertainty (continued)*

Analyte	Group	Analtye Code	TBV adj (mg/kg bw/d)	Species	INTERTAXON/T&E UNCERTAINTY FACTORS PASS[a]	AK[b]	GHO[c]	GE[d]	BE[e]	DM[f]	MD[g]	JR[h]	KF[i]	MDK[j]	SB[k]	Reference	Comment
Manganese	M	MN	410.00	Bird	5	5	5	10	10	NA	NA	NA	NA	5	5	Wiseman, 1987	Need to remain above nutritional requirements or UF & toxicology methods become invalid and indefensible.
Manganese	M	MN	66.67	Rat, mouse	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	NTP, 1993	Most recent study; well conducted. Earlier studies gave highly discrepant results.
2-Methylnapthalene	PAH	2MNAP	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Mercury	M	HG	2.50	Chicken	5	5	5	10	10	NA	NA	NA	NA	5	5	Thaxton et al., 1975; Thaxton and Parkhurst, 1973; Nicholson and Osborn, 1984.	Only inorganic avian value. Don't expect methyl mercury under oxidated, dry conditions.
Mercury	M	HG	1.30	Mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	Mitsumori et al., 1981	Mice may be more sensitive than rats aas indicated by Fitzhugh rat value. This species related to receptor species.
Naphthalene	PAH	NAP	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Nickel	M	NI	29.10	Chicken	5	5	5	10	10	NA	NA	NA	NA	5	5	Venugopal and Luckey, 1978.	Only avian value.
Nickel	M	NI	31.60	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	RTECs, 1996	Study concerns assessment endpoint.
Nitrate, nitrite-nonspecific	M	NIT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	M	NO3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	M	NO2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	MUN	NB	1.50	Mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	IRIS	Only value
N-Nitrosodiphenyl amine	SVOC	NNDPA	1333.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	HSDB	Only value
Octachlorodibenzodioxin	DIOX	OCDD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	See TCDD	See TCDD
Octachlorodibenzodioxin	DIOX	OCDD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	See TCDD	See TCDD
Octachlorodibenzofuran	DIOX	OCDF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
Octachlorodibenzofuran	DIOX	OCDF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
PCB-1248	PCB	PCB248	0.18	Ring-necked pheasant	5	5	5	10	10	NA	NA	NA	NA	NA	NA	See PCB1254	See PCB1254
PCB-1248	PCB	PCB248	0.57	mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	See PCB1254	See PCB1254
PCB-1254	PCB	PCB254	0.18	Ring-necked pheasant	5	5	5	10	10	NA	NA	NA	NA	NA	NA	Dahlgren et al., 1972	Longest avian study.
PCB-1254	PCB	PCB254	0.57	mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	Linzey, 1988	Longest mammalian study.
PCB-1260	PCB	PCB260	0.18	Ring-necked pheasant	5	5	5	10	10	NA	NA	NA	NA	NA	NA	See PCB1254	See PCB1254
PCB-1260	PCB	PCB260	0.57	mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	See PCB1254	See PCB1254
2,3,4,7,8-Pentachlorodibenzofuran	DIOX	234PCF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	See TCDD	See TCDD
2,3,4,7,8-Pentachlorodibenzofuran	DIOX	234PCF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	See TCDD	See TCDD
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	DIOX	78PCDD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	See TCDD	See TCDD
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	DIOX	78PCDD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	See TCDD	See TCDD
1,2,3,7,8-Pentachlorodibenzofuran	DIOX	78PCDF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	See TCDD	See TCDD
1,2,3,7,8-Pentachlorodibenzofuran	DIOX	78PCDF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	See TCDD	See TCDD
Pentaerythritol tetranitrate (PETN)	MUN	PETN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	PAH	PHANTR	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Benzo(a)pyrene	Use BAP for all PAHs
Phenol	VOL	PHENOL	60.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	IRIS	NA
Phosphate	M	PO4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 7-23. Application of Uncertainty Factors to Adjust for Intertaxon and Sensitive Species Uncertainty (continued)

Analyte	Group	Analtye Code	TBV adj (mg/kg bw/d)	Species	INTERTAXON/T&E UNCERTAINTY FACTORS: PASS[a]	AK[b]	GHO[c]	GE[d]	BE[e]	DM[f]	MD[g]	JR[h]	KF[i]	MDK[j]	SB[k]	Reference	Comment
ppDDD	PEST	PPDDD	0.10	bald eagle	5	5	5	6	2	NA	NA	NA	NA	NA	NA	see DDT	NA
ppDDD	PEST	PPDDD	8.50	mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	see DDT	NA
ppDDE	PEST	PPDDE	0.10	bald eagle	5	5	5	6	2	NA	NA	NA	NA	NA	NA	see DDT	NA
ppDDE	PEST	PPDDE	8.50	mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	see DDT	NA
ppDDT	PEST	PPDDT	0.10	bald eagle	5	5	5	6	2	NA	NA	NA	NA	NA	NA	Chura and Stewart, 1967; Stickel et al., 1966	Appropriate for assessment endpoint. Lower than DDE owl study; results similar to DDT kestrel, mallard study.
ppDDT	PEST	PPDDT	8.50	mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	Turusov et al., 1973	Chronic study; recent data (relatively), appropriate endpoints to address assessment endpoints. Rat study endpoints not clearly related to adverse population effects as lipids fluctuate seasonally; hypertrophy doesn't necessarily effect survival or repro.
Pyrene	PAH	PYR	3.33	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see BAP	Use BAP for all PAHs
RDX (Cyclonite)	MUN	RDX	0.20	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	MacPhail et al., 1985	Only value
Selenium	M	SE	0.66	Chicken	5	5	5	10	10	NA	NA	NA	NA	5	5	Ort and Latshaw, 1978	Appropriate endpoint. Must remain above required nutrient level.
Selenium	M	SE	0.19	Mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	Opresko et al., 1993	Appropriate endpoint. Must remain above required nutrient level.
Silver	M	AG	12.47	Turkey	5	5	5	10	10	NA	NA	NA	NA	5	5	Friberg et al., 1979	Only avian value.
Silver	M	AG	68.00	Pig	NA	NA	NA	NA	NA	5	4	5	10	NA	NA	Van Vleet, 1976	Appropriate endpoints. Both mammalian studies have consistent results.
Sulfate	M	SO4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin	DIOX	TCDD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	Schwetz et al., 1973	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin	DIOX	TCDD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Murray et al., 1979	NA
2,3,7,8-Tetrachlorodibenzo furan	DIOX	TCDF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	NA
2,3,7,8-Tetrachlorodibenzo furan	DIOX	TCDF	1.00E-06	Rat	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	see TCDD	NA
Tetrachloroethylene	VOL	TCLEE	14.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	CEPA, 1993e	NA
Thallium	M	TL	0.24	Ring-necked pheasant	5	5	5	10	10	NA	NA	NA	NA	5	5	Hudson et al., 1984	Only avian value.
Thallium	M	TL	0.10	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	Roll and Matthiaschk, 1981	Best study. Avoid drinking water exposure, repro. endpoint more sensitive than mortality one.
Toluene	VOL	MEC6H5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxins	DIOX	THCDD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
Total hexachlorodibenzo-p-dioxins	DIOX	THCDD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
Total hexachlorodibenzo furans	DIOX	THCDF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
Total hexachlorodibenzo furans	DIOX	THCDF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
Total heptachlorodibenzo-p-dioxins	DIOX	THPCDD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
Total heptachlorodibenzo-p-dioxins	DIOX	THPCDD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
Total heptachlorodibenzo furans	DIOX	THPCDF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
Total heptachlorodibenzo furans	DIOX	THPCDF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
Total pentachlorodibenzo-p-dioxins	DIOX	TPCDD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
Total pentachlorodibenzo-p-dioxins	DIOX	TPCDD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
Total pentachlorodibenzo furans	DIOX	TPCDF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD

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Table 7-23. Application of Uncertainty Factors to Adjust for Intertaxon and Sensitive Species Uncertainty (continued)

Analyte	Group	Analtye Code	TBV adj (mg/kg bw/d)	Species	PASS[a]	AK[b]	GHO[c]	GE[d]	BE[e]	DM[f]	MD[g]	JR[h]	KF[i]	MDK[j]	SB[k]	Reference	Comment
					INTERTAXON/T&E UNCERTAINTY FACTORS												
Total pentachlorodibenzo furans	DIOX	TPCDF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
Total petroleum hydrocarbons	TPH	TPHC	126.00	mallard	5	5	5	10	10	NA	NA	NA	NA	NA	NA	Stubblefield et al., 1995a	Only avian value.
Total petroleum hydrocarbons	TPH	TPHC	500.00	ferret	NA	NA	NA	NA	NA	5	5	5	8	NA	NA	Stubblefield et al., 1995b	Less overall uncertainty than mouse study. Repeated dosing.
Total phosphates	M	TPO4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxins	DIOX	TTCDD	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
Total tetrachlorodibenzofurans	DIOX	TTCDD	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
Total tetrachlorodibenzofurans	DIOX	TTCDF	6.67E-06	Chicken	5	5	5	10	10	NA	NA	NA	NA	NA	NA	see TCDD	see TCDD
Total tetrachlorodibenzofurans	DIOX	TTCDF	1.00E-06	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see TCDD	see TCDD
1,1,1-Trichloroethane	VOL	111TCE	57.00	Rabbit, guinea pig, rat	NA	NA	NA	NA	NA	3	5	2	10	NA	NA	Jorgensen et al., 1991	Only value
Trichloroethylene	VOL	TRCLE	33.33	Mouse	NA	NA	NA	NA	NA	4	5	5	10	NA	NA	CEPA, 1993f	Best study based on applicable exposure route.
2,4,6-Trinitrotoluene	MUN	246TNT	0.50	Dog	NA	NA	NA	NA	NA	5	5	5	6	NA	NA	Levine et al., 1983	Lower overall uncertainty. Similar value to rat.
Vanadium	M	V	2.67	Sheep	NA	NA	NA	NA	NA	5	4	5	10	NA	NA	Hansard et al., 1982	Best study. Rat & guinea pig endpoints a reach to population effects.
Xylenes	VOL	XYLEN	50.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	CEPA, 1993c	More information available for study. Mouse ok if primary citation found.
m-Xylene	VOL	13DMB	50.00	Rat	NA	NA	NA	NA	NA	3	5	5	10	NA	NA	see Xylenes	see Xylenes
Zinc	M	ZN	27.00	Mallard	5	5	5	10	10	NA	NA	NA	NA	1	5	Gasaway and Buss, 1972	Appropriate endpoint, long study.
Zinc	M	ZN	34.00	Pig	NA	NA	NA	NA	NA	5	4	5	10	NA	NA	Sutton and Nelson, 1937	Long term study; least uncertainty in toxicology, although study old, question analytical.

[a] Pass = Passerine birds.
[b] AK = American kestrel.
[c] GHO = Great horned owl.
[d] GE = Golden eagle.
[e] BE = Bald Eagle.
[f] DM = Deer mouse.
[g] MD = Mule deer.
[h] JR = Jackrabbit.
[i] KF = Kit fox.
[j] MDK = Mallard duck.
[k] SB = Shore bird.

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Table 7-24. Taxonomic Classifications for Uncertainty Factor Application

Common Name	Class	Order	Family	Genus	Species	Key Receptor
American robin	Aves	Passeriformes	Turdidae	Turdus	migratorius	N[a]
Barn Owl	Aves	Strigiformes	Tytonidae	Tyto	alba	N
Belted kingfisher	Aves	Coraciiformes	Alcedinidae	Megaceryle	alcyon	N
Black duck	Aves	Anseriformes	Anatidae	Anas	rubripes	N
Blue Grouse	Aves	Galliformes	Tetraonidae	Dendragapus	obscurus	N
Chicken	Aves	Galliformes	Phasianidae	Gallus	domesticus	N
Gray partridge	Aves	Galliformes	Phasianidae	Perdix	perdix	N
Mallard duck	Aves	Anseriformes	Anatidae	Anas	platyrhynchos	N
Mountain bluebird	Aves	Passeriformes	Turdidae	Sialia	currucoides	N
Mourning dove	Aves	Columbiformes	Columbidae	Zenaida	macroura	N
Partridge sp.	Aves	Galliformes	Perdicidae	NA[b]	NA	N
Pelican sp.	Aves	Pelecaniformes	Pelicanidae	NA	NA	N
Peregrine falcon	Aves	Falconiformes	Falconidae	Falco	peregrinus	N
Quail sp.	Aves	Galliformes	Phasianidae	NA	NA	N
Red-tailed Hawk	Aves	Falconiformes	Accipitridae	Buteo	jamaicensis	N
Red winged blackbird	Aves	Passeriformes	Icteridae	Agelaius	phoeniceus	N
Ring-necked pheasant	Aves	Galliformes	Phasianidae	Phasianus	colchicus	N
Ring dove	Aves	Columbiformes	Columbidae	Streptopelia	risoria	N
Spotted sandpiper	Aves	Charadriiformes	Scolopacidae	Actitis	macularia	N
Tern sp.	Aves	Charadriiformes	Laridae,Sterninae	NA	NA	N
Turkey	Aves	Galliformes	Phasianidae	Meleagris	gallopavo	N
American kestrel	Aves	Falconiformes	Falconidae	Falco	sparverius	Y[c]
Bald eagle	Aves	Falconiformes	Accipitridae	Haliaeetus	leucocephalus	Y
Golden eagle	Aves	Falconiformes	Accipitridae	Aquila	chrysaetos	Y
Great horned owl	Aves	Strigiformes	Strigidae	Bubo	virginianus	Y
Passerine	Aves	Passeriformes	NA	NA	NA	Y
Cat	Mammalia	Carnivora	Felidae	Felis	domesticus	N
Cow	Mammalia	Artiodactyla	Bovidae	Bos	taurus	N
Dog	Mammalia	Carnivora	Canidae	Canis	familiaris	N
Ferret	Mammalia	Carnivora	Mustelidae	Mustela	sp.	N
Grazer	Mammalia	Artiodactyla	NA	NA	NA	N
Guinea pig	Mammalia	Rodentia	Caviae	Cavia	porcellus	N
Hamster	Mammalia	Rodentia	Muridae	Cricetus	cricetus	N
Least chipmunk	Mammalia	Rodentia	Sciuridae	Eutamias	minimus	N
Long-tailed vole	Mammalia	Rodentia	Muridae	Microtus	longicaudus	N
Mink	Mammalia	Carnivora	Mustelidae	Mustela	vision	N
Mouse, lab	Mammalia	Rodentia	Muridae	Mus	musculus	N
Pig	Mammalia	Artiodactyla	Suidae	Sus	scrofa	N
Pocket Gopher	Mammalia	Rodentia	Geomyidae	Thomomys	bottae	N
Rabbit	Mammalia	Lagomorpha	Leporidae	Lepus	cuniculus	N
Racooon	Mammalia	Carnivora	Procyonidae	Procyon	lotor	N
Rat, lab	Mammalia	Rodentia	Muridae	Rattus	norvegicus	N
Red fox	Mammalia	Carnivora	Canidae	Vulpes	fulva	N
Sheep	Mammalia	Artiodactyla	Bovidae	Ovis	aries	N
Short-tailed shrew	Mammalia	Insectivora	Soricidae	Blarina	brevicauda	N
Western Harvest Mouse	Mammalia	Rodentia	Muridae	Reithrodontomys	megalotis	N
Black-tailed jackrabbit	Mammalia	Lagomorpha	Leporidae	Lepus	californicus	Y
Deer Mouse	Mammalia	Rodentia	Muridae	Peromyscus	maniculata	Y
Kit Fox	Mammalia	Carnivora	Canidae	Vulpes	macrotis	Y
Mule Deer	Mammalia	Artiodactyla	Cervidae	Odocoileus	hemionus	Y

[a]No.

[b]Not available or not applicable.

[c]Yes.

Sources:

Burt and Grossenheider, 1980 — Peterson Field Guides: Mammals

Palmer and Fowler, 1975 — Fieldbook of Natural History

Source: Udvardy, 1977 — Audubon Society: Field Guide to North American Birds, Western Region

Table 7-25. Application of Uncertainty Factors to Develop NOAEL-Based TBVs

Analyte	Analtye Code	TBV (mg/kg bw/d)	Basis for TBV	Study Duration UFs: Acute (<14 d)	Sub acute (15-30d)	Chronic (>30 d)	LD50 or LC50	Study Endpoint UFs: TD lethal	TD non lethal	NOAEL lethal LOAEL nonlethal	NOAEL non lethal	TBV UFs	TBV adj (mg/kg bw/d)
Acenaphthene	ANAPNE	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	ACET	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	ACLDAN	2.13	NOAEL for mortality	1	1	1	1	1	1	3	1	3	0.7
alpha-Chlordane	ACLDAN	14.1	RMA critical value for all birds except duck.	1	1	1	1	1	1	1	1	1	14.1
alpha-Chlordane	ACLDAN	1.2	RMA Critical Value for mammals. NOEL.	1	1	1	1	1	1	1	1	1	1.2
Aluminum	AL	40	NEL for growth impairment (est. from 6 mg. amount given to 150 gm. rat.)	1	1	1	1	1	1	1	1	1	40.0
Aluminum	AL	200	Growth retardation, alter carbohydrate and phosphate metabolism. 1-2% in diet stimulates growth in other studies. Use this as dose unlikely to affect populations.	1	1	1	1	1	1	3	1	3	66.7
Aluminum	AL	5.04	Dietary levels of 2000 ppm for 56 days decreased weight gain. Convert with 0.03 g/g/d estimated from same study. Control diet 168 ppm (use as NEL). Ruminants likely more sensitive than nonruminants.	1	1	1	1	1	1	1	1	1	5.0
Aluminum	AL	48	Dietary levels of 1200 ppm did not alter serum or tissue P levels. Convert with 0.04 g/g/d from Sax, 1984.	1	1	1	1	1	1	1	1	1	48.0
Anthracene	ANTRC	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	SB	10	10 mg/kg bw/day caused overt toxicity in dogs and cats.	1	1	1	1	1	5	1	1	5	2.0
Antimony	SB	1.78	5 mg/L (converted with ingestion rate of 0.356 L/kg bw/d from Perry et al., 1989) decreased lifespan by 15% in rats. Unlikely to affect population.	1	1	1	1	1	1	3	1	3	0.6
Arsenic	AS	14	NOAEL @ 100 ppm in diet for behavior (LOAEL was 300 ppm for behavior and growth). Converted with 0.14 kg diet/kg bw from Camardese et al., 1990.	1	1	1	1	1	1	1	1	1	14.0
Arsenic	AS	3.8	NOAEL (LOAEL was 22.5 mg/kg bw/day for growth, liver lesions)	1	1	1	1	1	1	1	1	1	3.8
Arsenic	AS	2	Maximum tolerated in diet 50 ppm, dwb (convert with 0.04 kg diet/kg bw from Sax, 1984)	1	1	1	1	1	1	1	1	1	2.0
Barium	BA	97	NOAEL is 1000 ppm diet. Slight growth depression at 2,000-4,000 ppm. Converted with 0.097 kg/kg bw/d from Wiseman (1987).	1	1	1	1	1	1	1	1	1	97.0
Barium	BA	35.6	NEL for overt toxicity and survival. Caused hypertension. Estimate from 100 ppm in drinking water and 15 ml/45 g bw/d ingestion rate from same study.	1	1	1	1	1	1	3	1	3	11.9
Benzo(a) Anthracene	BAANTR	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	BAPYR	10	LOAEL for reproductive success	1	1	1	1	1	1	3	1	3	3.3
Benzo(a)pyrene	BAPYR	9.5	NOEL and LOEL for decreased survival and body weight, 96 week exposure. Converted with assumed body weight of 0.050 kg, inhalation rate of 0.05 m3/d (EPA, 1993).	1	1	1	1	1	5	1	1	5	1.9
Benzo(b) Fluoranthene	BBFANT	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	BGHIPY	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	BKFANT	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl alcohol	BZALC	100	LD50 study	10	1	1	10	1	1	1	1	100	1.0
Benzyl alcohol	BZALC	1040	LD50 study	10	1	1	10	1	1	1	1	100	10.4
Beryllium	BE	485	Caused rickets in poultry, other livestock at 0.5% of diet. Use 0.097 kg/kg bw/day from Wiseman (1987) to convert.	1	1	1	1	1	5	1	1	5	97.0
Beryllium	BE	0.54	NOAEL for weight loss	1	1	1	1	1	1	1	1	1	0.5
Beryllium	BE	42.5	Mild weight loss, 2 yr study. Estimate with 0.085 g/g bw/d (Groton et al 1991).	1	1	1	1	1	1	1	1	1	42.5
Bis(2-ethylhexyl) phthalate	B2EHP	156	Decreased egg production and body weight, for a 4 week exposure. Higher concentrations caused cessation of laying. Used 1.45 kg body weight (Wiseman, 1987) for hen weight; 226 mg/hen/day intake.	1	5	1	1	1	1	3	1	15	10.4
Bis(2-ethylhexyl) phthalate	B2EHP	2.4	Increased body weight; 30 day exposure. Converted from 25 ppm w/0.097 g/g bw/day for chicken (Wiseman, 1987).	1	5	1	1	1	1	1	1	5	0.5
Bis(2-ethylhexyl) phthalate	B2EHP	510	Decreased body weight; testicular atrophy; 6,000-12,000 ppm diet converted with 0.085 (Groton et al., 1991).	1	1	1	1	1	5	1	1	5	102.0
Bis(2-ethylhexyl) phthalate	B2EHP	780	Decreased body weight; male reproductive effects; 3,000-6,000 ppm diet converted with 0.26 g/g bw/day (EPA, 1993).	1	1	1	1	1	5	1	1	5	156.0
Butylbenzyl phthalate	BBZP	see B2EHP for birds	see B2EHP for birds	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzyl phthalate	BBZP	see B2EHP for mammals	see B2EHP for mammals	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	CD	2	NOAEL for adults; LOAEL for kidney lesions in ducklings. Lesions uncertain for population effects w/o link to survival or repro.	1	1	1	1	1	1	3	1	3	0.7
Cadmium	CD	2.5	NOAEL for behavior, condition, body weight, food consumption (30 ppm)	1	1	1	1	1	1	1	1	1	2.5
Cadmium	CD	24.3	Renal effects from 300 ppm diet, 10 month study. Estimated with 0.081 g/g bw/d from Equation 3-9 (EPA, 1993) and assumed body weight of 1.3 kg.	1	1	1	1	1	5	1	1	5	4.9
Cadmium	CD	0.002	Maximum tolerated 0.05 ppm dwb, converted with 0.04 kg diet/kg bw. (Sax,	1	1	1	1	1	1	1	1	1	0.002
Chloromethane	CH3CL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	CHCL3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 7-25. Application of Uncertainty Factors to Develop NOAEL-Based TBVs (continued)

Analyte	Analtye Code	TBV (mg/kg bw/d)	Basis for TBV	Study Duration UFs: Acute (<14 d)	Sub acute (15-30d)	Chronic (>30 d)	LD50 or LC50	Study Endpoint UFs: TD lethal	TD non lethal	NOAEL lethal LOAEL nonlethal	NOAEL non lethal	TBV UFs	TBV adj (mg/kg bw/d)
Chlordane	CLDAN	NA	See ALCLDAN for birds	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane	CLDAN	NA	See ALCLDAN for mammals	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (III)	CR	0.63	NOAEL for adults (0.63 mg/kg bw/d converted with 0.063 kg/kg bw/d for adult from EPA, 1993b)	1	1	1	1	1	1	1	1	1	0.6
Chromium (III)	CR	1.26	10 ppm in diet decreased growth, survival in juveniles (1.26 mg/kg bw/d converted with 0.126 kg/kg bw/d for 100 gm duckling estimated from allometric equations in EPA, 1993)	1	1	1	1	7	1	1	1	7	0.2
Chromium (III)	CR	1.28	NOEL for wild populations. Concentration in major prey items 7.6 ppm converted by author. No effect on reproduction or population success.	1	1	1	1	1	1	1	1	1	1.3
Chromium (III)	CR	0.97	10 ppm in diet converted with 0.097 kg diet/kg bw/d for chicken (Wiseman, 1987) decreased egg production.	1	1	1	1	1	1	3	1	3	0.3
Chromium (III)	CR	9.7	NOEL for 32 days was a 100 ppm diet.	1	1	1	1	1	1	1	1	1	9.7
Chromium (III)	CR	20	NEL for 80 day exposure to 50-1000 mg/cat/d; convert with assumed body weight of 2.5 kg.	1	1	1	1	1	1	1	1	1	20.0
Chromium (III)	CR	1.78	NEL for rats exposed to 5 mg/L in drinking water; convert with ingestion rate of 0.356 L/kg bw/d (Perry et al., 1989)	1	1	1	1	1	1	1	1	1	1.8
Chromium (VI)	CRHEX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	CHRY	see BAP	see BAP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	CO	2520	LEL for growth was 0.2% of diet. Convert with 1.26 kg/kg bw/day from EPA, 1993 allometric equation and assumed body weight of 100 g.	1	1	1	1	1	1	3	1	3	840.0
Cobalt	CO	0.039	Altered thyroid function for 150 ug/d in diet. Convert with 0.26 kg diet/kg bw/d from EPA, 1993 for mouse. Unlikely to adversely affect populations.	1	1	1	1	1	1	3	1	3	0.013
Cobalt	CO	10	Peroral dose of 10 - 100 mg/kg for more than 2 weeks cardiotoxic.	1	5	1	1	1	5	1	1	25	0.4
Cobalt	CO	47	Increased mortality for 2.5 month study due to decreased resistance to virus.	1	1	1	1	7	1	1	1	7	6.7
Cobalt	CO	12	NOAEL for maternal toxicity based on weight gain of food consumption; adverse effects on pup survival and development when given day 14-21 gestation. Pup survival affected at maternal dose of 12 mg/kg bw/d.	10	1	1	1	1	5	1	1	50	0.2
Cobalt	CO	0.019	Nutritional requirement	1	1	1	1	1	1	1	1	1	0.019
Cobalt	CO	10	All species get polycythemia above this intake.	1	1	1	1	1	1	1	1	1	10.0
Copper	CU	29	NOAEL for weight gain, mortality	1	1	1	1	1	1	1	1	1	29.0
Copper	CU	55.29	NOAEL of 570 ppm for 10 wks. for weight gain, mortality. At 749 ppm, mortality was 15%, weight reduced 30% relative to controls. Convert with 0.097 g/g bw/d, Wiseman, 1987.	1	1	1	1	1	1	1	1	1	55.3
Copper	CU	1	Maximum chronic intake tolerated for grazers is 25-300 ppm in diet, dwb. Daily intake calculated with 0.04 kg diet/kg bw for cow (Sax, 1984).	1	1	1	1	1	1	1	1	1	1.0
Copper	CU	20	Hemolysis after 9 weeks exposure.	1	1	1	1	1	5	1	1	5	4.0
Copper	CU	13	Rats gained more weight on 50 ppm diet; converted with 0.26 kg diet/kg bw/d for mouse (EPA, 1993b).	1	1	1	1	1	1	1	1	1	13.0
Copper	CU	8.5	Pigs gained more weight on 250 ppm (8.5 mg/kg bw/d). At 500 ppm diet (17 mg/kg bw/d), anemia occurred. Converted with 0.034 kg/kg bw/d (Wiseman,	1	1	1	1	1	1	1	1	1	8.5
Copper	CU	7.865	25-50 ppm NEL or beneficial. 100 ppm in diet decrease weight gain, may increase kit mortality due to effect on lactation. Controls had 60.5 ppm in diet. Study 357 d duration. Convert w/0.13 g/g/d EPA, 1993.	1	1	1	1	1	1	1	1	1	7.9
Copper	CU	0.32	Nutritional requirement	1	1	1	1	1	1	1	1	1	0.3
Cyanide	CYN	3	LD50	10	1	1	10	1	1	1	1	100	0.0
Cyclotetramethylene tetranitramine (HMX)	HMX	150	TDlo (liver, kidney damage, decreased weight gain), subchronic exposure.	1	5	1	1	1	5	1	1	25	6.0
Dibenzo(a,h)anthracene	DBAHA	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	DBZFUR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorobenzene-nonspecific	DCLB	see 1,2 DCB	see 1,2 DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibutyl phthalate	DNBP	1.1	NOAEL for shell thickness and other reproductive effects; 10 ppm diet.	1	1	1	1	1	1	1	1	1	1.1
Dibutyl phthalate	DNBP	see B2EHP	see B2EHP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioctyl phthalate	DNOP	see B2EHP	see B2EHP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	12DCLB	25	NOEL, subchronic oral study, endpoints of body weight, survival, histopathology, hematology, organ weight range from 25-125 mg/kg bw/d.	1	5	1	1	1	1	1	1	5	5.0
1,2-Dichlorobenzene	12DCLB	1208	NOEL. Converted with body weight of 1.5 kg, inhalation rate of 0.755 m3/d from EPA, 1993.	1	1	1	1	1	1	1	1	1	1208.0
1,3-Dichlorobenzene	13DCLB	see 1,2 DCB	see 1,2 DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	14DCLB	see 1,2 DCB	see 1,2 DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 7-25. Application of Uncertainty Factors to Develop NOAEL-Based TBVs (continued)

Analyte	Analtye Code	TBV (mg/kg bw/d)	Basis for TBV	Study Duration UFs: Acute (<14 d)	Sub acute (15-30d)	Chronic (>30 d)	LD50 or LC50	Study Endpoint UFs: TD lethal	TD non lethal	NOAEL lethal LOAEL nonlethal	NOAEL non lethal	TBV UFs	TBV adj (mg/kg bw/d)
2,4-Dichlorophenoxy acetic acid	24D	800	LD50	10	1	1	10	1	1	1	1	100	8.0
2,4-Dichlorophenoxy acetic acid	24D	100	LD50	10	1	1	10	1	1	1	1	100	1.0
2,4-Dichlorophenoxy acetic acid	24D	368	LD50	10	1	1	10	1	1	1	1	100	3.7
2,4-Dichlorophenoxy acetic acid	24D	500	LD50	10	1	1	10	1	1	1	1	100	5.0
Dieldrin	DLDRN	1.25	LOAEL for mortality for a 30 day study ranged from 1.25 to 5.0	1	5	1	1	7	1	1	1	35	0.036
Dieldrin	DLDRN	0.97	NEL for mortality for an 8 week study. Converted from 10 ppm diet with 0.097 kg diet/kg bw/d from Wiseman (1987).	1	1	1	1	1	1	1	1	1	1.0
Dieldrin	DLDRN	0.5	NEL for breeding success and mortality.	1	1	1	1	1	1	1	1	1	0.5
Dieldrin	DLDRN	0.06	NOAEL of 0.3 ug/g for growth observed for 24 d study. Converted with ingestion rate of 75 g/211 to 379 g bw = 0.20 to 0.36 g/g bw/d at day 24, from same study. LOAEL was 16.4 ug/g.	1	5	1	1	1	1	1	1	5	0.012
Dieldrin	DLDRN	137.28	14 day LC50 ranged from 66 to 132 mg/kg diet. Converted with ingestion rate of 1.17- 2.08 g/g bw/d from same study.	10	1	1	10	1	1	1	1	100	1.4
Dieldrin	DLDRN	0.05	NOAEL for health, behavior, body weight in 2 year study. Some altered serum chemistry that the authors considered toxicologically unimportant.	1	1	1	1	1	1	1	1	1	0.1
Dieldrin	DLDRN	2.6	LOAEL for behavior, liver lesions in 2 year study was 10 ppm in diet. This was a NEL for mortality. Converted with 0.26 kg diet/kg bw/d from EPA, 1993b.	1	1	1	1	1	1	3	1	3	0.9
Dieldrin	DLDRN	0.26	Long term study, 0.31 mg/kg bw/d decreased survival slightly in young, decreased conception. At 1 ppm in diet (0.26 mg/kg bw/d converted with value for deer mouse of 0.26 kg diet/kg bw/d from EPA, 1993) altered liver histopathology.	1	1	1	1	1	5	1	1	5	0.1
Dimethyl phthalate	DMP	see B2EHP for birds	see B2EHP for birds	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	DMP	see B2EHP for mammals	see B2EHP for mammals	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4 Dinitrotoluene	24DNT	3.9	TDlo, reproductive effects, chronic	1	1	1	1	1	5	1	1	5	0.8
2,4 Dinitrotoluene	24DNT	1.5	TDlo(nervous system, weight gain, reproductive effects; all dogs affected, whereas only 1 dog at 1.5 mg/kg bw/d affected) chronic.	1	1	1	1	1	5	1	1	5	0.3
Endosulfan II	BENSLF	31.2	LD50	10	1	1	10	1	1	1	1	100	0.3
Endrin	ENDRN	0.25	LD50	10	1	1	10	1	1	1	1	100	0.003
Endrin	ENDRN	0.0315	NEL for reproductive effects in a 12 week study. Dietary level 0.5 ppm. 3 ppm decreased embryo survival, and decreased male body weight by 4.5%. Convert with 0.063 g/g bw/d from EPA (1993).	1	1	1	1	1	1	3	1	3	0.011
Endrin	ENDRN	0.97	LEL for mortality in 8 week long study.	1	1	1	1	7	1	1	1	7	0.1
Endrin	ENDRN	180.96	LC50 for 14 day exposure with range of 87 - 174 mg/kg diet. Converted with ingestion rate of 1.17-2.08 from same study as described under DDT.	10	1	1	10	1	1	1	1	100	1.8
Endrin Aldehyde	ENDRNA	see Endrin	see Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	ENDRNA	see Endrin	see Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	ETC6H5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	FANT	see BAP	see BAP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	FLRENE	see BAP	see BAP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	F	3.2	LOAEL for bone mineralization effects, chronic study with drinking water ingestion. Skeletal effects inconsistent in rats; otherstudies report NOEL at 5 weeks at 12.7 mg/kg bw/d; LOEL at 21 d of 4.7 mg/kg bw/d.	1	1	1	1	1	1	1	1	1	3.2
Fluoride	F	0.877	Stimulate bone formation 20% above control. At 363.2 mg/L (79.9 mg/kg bw/d) converted with 0.22 L/kg bw/d ingestion rate for deer mouse (EPA, 1993), decreased survival occurred.	1	1	1	1	1	1	1	1	1	NA
Fluoride	F	0.32	Unspecified changes in bone at histopathological level.	1	1	1	1	1	1	1	1	1	0.3
gamma-BHC (Lindane)	LIN	30	LOAEL for mortality for 30 day study	1	5	1	1	1	5	1	1	25	1.2
gamma-BHC (Lindane)	LIN	0.97	NEL for mortality in 8 week study where chickens given 10 ppm in diet. Converted with 0.097 kg diet/kg bw/d from Wiseman (1987).	1	1	1	1	1	1	3	1	3	0.3
gamma-Chlordane	GCLDAN	2.13	NOAEL for mortality	1	1	1	1	1	1	3	1	3	0.7
Heptachlor	HPCL	2080	LD50 exceeded 2,080 mg/kg bw.	10	1	1	10	1	1	1	1	100	20.8
Heptachlor	HPCL	0.97	NEL for mortality in 8 week study where chickens given 10 ppm in diet. Converted with 0.097 kg diet/kg bw/d from Wiseman (1987).	1	1	1	1	1	1	3	1	3	0.3
Heptachlor Epoxide	HPCLE	See heptachlor	See heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 7-25. Application of Uncertainty Factors to Develop NOAEL-Based TBVs (continued)

				Study Duration UFs				Study Endpoint UFs					
Analyte	Analyte Code	TBV (mg/kg bw/d)	Basis for TBV	Acute (<14 d)	Sub acute (15-30d)	Chronic (>30 d)	LD50 or LC50	TD lethal	TD non lethal	NOAEL lethal LOAEL nonlethal	NOAEL non lethal	TBV UFs	TBV adj (mg/kg bw/d)
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	678HPD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	678HPD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzo furan	678HPF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	678HPF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	789HPF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	789HPF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo p-dioxin	678HXD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo p-dioxin	678HXD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo p-dioxin	789HXD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo p-dioxin	789HXD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo p-dioxin	78HXDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo p-dioxin	78HXDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	234HXF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	234HXF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	678HXF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	678HXF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	78HXDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	78HXDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	ICDPYR	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	FE	390	Assumed based on nutritional requirements of 2.4-3.9 mg/kg bw/day (Wiseman, 1987).	1	1	1	1	1	1	1	1	1	390.0
Iron	FE	19.55	230 ppm in basal diet of controls. Convert with 0.085 g/g bw/d from Groton et al., 1991.	1	1	1	1	1	1	1	1	1	19.6
Iron	FE	260	Assumed based on nutrient requirement of 2.6 mg/kg bw/d.	1	1	1	1	1	1	1	1	1	260.0
Iron	FE	2.36	Nutritional requirement	1	1	1	1	1	1	1	1	1	2.4
Iron	FE	3.88	Nutritional requirement	1	1	1	1	1	1	1	1	1	3.9
Lead	PB	14.5	NOAEL (for survival, growth) from diet of 50 ppm (25 mg/kg bw/d) converted with 0.29 kg diet/kg bw (kestrel)(EPA, 1993b). A NOAEL of 14.5 mg/kg for survival, histopathology and reproduction also reported.	1	1	1	1	1	1	1	1	1	14.5
Lead (acetate)	PB	9.7	Dietary level of 100 ppm lead acetate tolerated, 8 wk study, 0.097 g/g bw/d (Wiseman, 1987) used to convert.	1	1	1	1	1	1	1	1	1	9.7
Lead	PB	6.5	LOAEL of 25 mg/kg diet lead salts. Caused impaired reproduction. Converted with 0.26 kg diet/kg bw (EPA, 1993).	1	1	1	1	1	1	3	1	3	2.2
Lead (acetate)	PBORG	11.985	Females on 2000 ppm had higher mortality than controls; males on 500 and 2000, but not 1000 ppm diet had higher mortality. Controls high mortality over 2 year study. Uses 141 ppm as NOAEL, 2000 as LOAEL. Use 0.085 g/g/d, Groton et al., 1991 to convert.	1	1	1	1	1	1	3	1	3	4.0
Lead (acetate)	PBORG	79	NOAEL for appearance, behavior, weight gain, mortality, or neurology for dogs on 500 ppm diet for 2 yr. Convert with ingestion rate of 0.158 g/g bw/d for red fox (EPA, 1993).	1	1	1	1	1	1	1	1	1	79.0
Lead	PB	1.2	Maximum tolerated in diet 30 ppm, dwb. Convert with 0.04 kg diet/kg bw (Sax, 1984).	1	1	1	1	1	1	1	1	1	1.2

Table 7-25. Application of Uncertainty Factors to Develop NOAEL-Based TBVs (continued)

				Study Duration UFs				Study Endpoint UFs					
Analyte	Analtye Code	TBV (mg/kg bw/d)	Basis for TBV	Acute (<14 d)	Sub acute (15-30d)	Chronic (>30 d)	LD50 or LC50	TD lethal	TD non lethal	NOAEL lethal LOAEL nonlethal	NOAEL non lethal	TBV UFs	TBV adj (mg/kg bw/d)
Manganese	MN	410	Assumed based on nutritional requirements of 6.8 and 4.13 for chickens and ducks (Wiseman, 1987)	1	1	1	1	1	1	1	1	1	410.0
Manganese	MN	1	NEL for 60 day exposure for behavior and gross pathology in growing rats. Microscopic degeneration observed.	1	1	1	1	1	1	1	1	1	1.0
Manganese	MN	5200	NEL was 20,000 ppm for 28 day exposure for weight, histology. Microscopic degeneration observed. Converted with 0.26 kg/kg bw/d for mice from EPA, 1993. LEL was 200,000 ppm.	1	5	1	1	1	1	1	1	5	1040.0
Manganese	MN	200	NOAEL for mortality for chronic exposure; 615 the LOAEL for mortality. NOAEL for mice 160-200.	1	1	1	1	1	1	3	1	3	66.7
Manganese	MN	80	Maximum chronic tolerated dietary level is 400 - 2000 ppm dwb (converted with 0.04 kg diet/kg bw (Sax, 1984))	1	1	1	1	1	1	1	1	1	80.0
2-Methylnapthalene	2MNAP	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	HG	2.5	NOAEL for growth; 12.5 the LOAEL (convert with 0.097 kg diet/kg bw/day (Wiseman, 1987)). 12.5 mg/kg bw/d affects quail reproduction. 1.1 NEL for starling.	1	1	1	1	1	1	1	1	1	2.5
Mercury (organic)	HG	0.25	LOAEL for reproductive effects in a 350 d study with organic mercury. This was a NOAEL for mortality.	1	1	1	1	1	1	3	1	3	0.1
Mercury (organic)	HG	0.0315	Study with 3 generations fed 0.5 and 3 ppm methyl mercury in diet. NEL for body weight, mortality was 0.5 ppm. Convert with 0.063 kg/kg bw/d EPA, 1993b. LOAEL 3 ppm for hatchling survival decrease 10%.	1	1	1	1	1	1	1	1	1	0.032
Mercury (organic)	HG	0.189	Diet of 3 ppm methyl mercury over 2 yr. period reduced reproductive success. Convert with 0.063 kg/kg bw/d EPA, 1993.	1	1	1	1	1	1	3	1	3	0.1
Mercury (organic)	HG	0.3861	No mortality (NEL) during 12 week study at 3.9 ppm methyl mercury in diet. Mortality (LEL) at 7.2 ppm. Converted with 0.099 kg diet/kg bw/d from EPA, 1993b.	1	1	1	1	1	1	3	1	3	0.1
Mercury (organic)	HG	0.56	NOAEL for 2 yr. study with organic mercury. 2.2 mg/kg bw/d the LOAEL for growth, mortality.	1	1	1	1	1	1	1	1	1	0.6
Mercury	HG	14	NOAEL for 2 yr. study with inorganic mercury for reproduction, development. No LOAEL.	1	1	1	1	1	1	1	1	1	14.0
Mercury	HG	3.9	Increased morbidity. Converted from 15 ppm in diet with 0.26 kg diet/kg bw/d (EPA, 1993).	1	1	1	1	1	1	3	1	3	1.3
Mercury	HG	0.75	NOAEL	1	1	1	1	1	1	1	1	1	0.8
Naphthalene	NAP	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NI	87.3	900 LEL for growth inhibition (estimated from 900 ppm diet and 0.097 kg/kg bw/d from Wiseman, 1987). 1,000 ppm a NEL in other studies.	1	1	1	1	1	1	3	1	3	29.1
Nickel	NI	158	TDlo for multigeneration study for effects on embryo or fetus.	1	1	1	1	1	5	1	1	5	31.6
Nickel	NI	24.15	NOAEL for reproduction.	1	1	1	1	1	1	1	1	1	24.2
Nickel	NI	12	NEL for 200 day study.	1	1	1	1	1	1	1	1	1	12.0
Nitrate, nitrite-nonspecific	NIT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NO3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	NO2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NB	4.5	LOAEL (hematology; adrenal, renal, hepatic lesions), chronic. Derived from inhalation study.	1	1	1	1	1	1	3	1	3	1.5
N-Nitrosodiphenyl amine	NNDPA	4000	NOEL for survival, derived from LOAEL for carcinomas and cutaneous	1	1	1	1	1	1	3	1	3	1333.3
Octachlorodibenzodioxin	OCDD	See TCDD	See TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzodioxin	OCDD	See TCDD	See TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	OCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	OCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1248	PCB248	0.067	NOAEL for reproductive effects for 8 week study. LOAEL was 0.67 mg/kg bw/d.	1	1	1	1	1	1	1	1	1	0.1
PCB-1254	PCB254	0.18	NOAEL for reproduction, 16 week study. LOAEL was 1.8 mg/kg bw/d.	1	1	1	1	1	1	1	1	1	0.2
PCB-1254	PCB254	1.5	NOAEL for reproduction, 1 month study. No LOAEL.	1	5	1	1	1	1	1	1	5	0.3
PCB-1254	PCB254	0.13	NOAEL for reproductive effects for 9 week study. LOAEL was 1.3 mg/kg bw/d.	1	1	1	1	1	1	1	1	1	0.1
PCB-1254	PCB254	1.7	LOAEL for reproductive effects in a 2 generation study.	1	1	1	1	1	1	3	1	3	0.6
PCB-1254	PCB254	0.07	NOAEL for reproduction	1	1	1	1	1	1	1	1	1	0.1
PCB-1260	PCB1260	See PCB-1254	See PCB-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	234PCF	See TCDD	See TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	234PCF	See TCDD	See TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	78PCDD	See TCDD	See TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 7-25. Application of Uncertainty Factors to Develop NOAEL-Based TBVs (continued)

				Study Duration UFs				Study Endpoint UFs					
Analyte	Analyte Code	TBV (mg/kg bw/d)	Basis for TBV	Acute (<14 d)	Sub acute (15-30d)	Chronic (>30 d)	LD50 or LC50	TD lethal	TD non lethal	NOAEL lethal LOAEL nonlethal	NOAEL non lethal	TBV UFs	TBV adj (mg/kg bw/d)
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	78PCDD	See TCDD	See TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	78PCDF	See TCDD	See TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	78PCDF	See TCDD	See TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	PETN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	PHANTR	see Benzo(a)pyrene	see Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	PHENOL	60	NOAEL, chronic, oral study demonstrating decreased fetal weight.	1	1	1	1	1	1	1	1	1	60.0
Phosphate	PO4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ppDDD	PPDDD	See DDT for birds	See DDT for birds	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ppDDD	PPDDD	See DDT for mammals	See DDT for mammals	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ppDDE	PPDDE	3	LEL for eggshell thickness, embryo mortality, reproductive success.	1	1	1	1	7	1	1	1	7	0.4
ppDDE	PPDDE	See DDT for mammals	See DDT for mammals	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ppDDT	PPDDT	0.25	LOAEL for 26 week study for reproductive success. Other data indicate 1 a NOAEL and 2.5 mg/kg bw/d a LOAEL for quail for reproduction and mortality.	1	1	1	1	1	1	1	1	1	0.3
ppDDT	PPDDT	0.12	NOAEL for eggshell thinning, 11 month study. LOAEL was 1.2.	1	1	1	1	1	1	1	1	1	0.1
ppDDT	PPDDT	0.11	NOAEL for 5.5 month study for eggshell thinning. LOAEL was 1.1 mg/kg bw/d.	1	1	1	1	1	1	1	1	1	0.1
ppDDT	PPDDT	0.3	NOAEL for mortality for 112 day study. The LOAEL was 3 mg/kg bw/d.	1	1	1	1	1	1	3	1	3	0.1
ppDDT	PPDDT	0.02*	Chronic LOAEL for reproduction; value is for DDT and metabolites. UF as per EPA, 1995.	1	1	1	1	1	1	3	1	3	0.0
ppDDT	PPDDT	14.5	LOEL for decreased lipid by 30%, increased liver weight by 20% due to	1	1	1	1	1	1	3	1	3	4.8
ppDDT	PPDDT	8.5	NOAEL for mortality, longevity for chronic study. LOAEL was 43 mg/kg wb/day.	1	1	1	1	1	1	1	1	1	8.5
ppDDT	PPDDT	0.8	NOAEL for reproductive effects for chronic study. 4.0 mg/kg bw/day the LOAEL. Suspect study due to antiquated analytical techniques.	1	1	1	1	1	1	1	1	1	0.8
ppDDT	PPDDT	1745.12	14-day LC50 ranged from 839 to greater than 2552 ppm diet. Shrews fed 25-30 g diet per day/14.4 to 21.3 g bw; dietary ingestion rate 1.17 -2.08 g/g bw/d.	10	1	1	10	1	1	1	1	100	17.5
Pyrene	PYR	see BAP	see BAP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX (Cyclonite)	RDX	1	NOAEL, 30 day, subchronic oral exposure	1	5	1	1	1	1	1	1	5	0.2
Selenium	SE	0.66	NOAEL for egg production and egg weight, although slight decrease in	1	1	1	1	1	1	1	1	1	0.7
Selenium	SE	0.485	Threshold for diet of 5 ppm for farm animals and poultry for effects on growth, survival. Convert with 0.097 kg diet/kg bw/d from Wiseman, 1987.	1	1	1	1	1	1	1	1	1	0.5
Selenium	SE	0.0097	Required as nutrient.	1	1	1	1	1	1	1	1	1	0.010
Selenium	SE	0.252	16 ppm diet decreased hatching success in 100 d study. 8 ppm increased malformed embryos. 4 ppm diet NOAEL. Convert w/ 0.063 g/g bw/d from EPA,	1	1	1	1	1	1	1	1	1	0.3
Selenium	SE	0.945	NEL for 21 week study for mortality is 15 ppm in diet; this will cause reproductive problems. 100 ppm in diet lethal. Convert with 0.063 kg diet/kg bw/day from EPA, 1993b. 40 ppm in diet lethal to ducklings.	1	1	1	1	1	1	3	1	3	0.3
Selenium	SE	0.2	Threshold for diet of 5 ppm for farm animals and poultry for effects on growth, survival. Convert with 0.04 kg diet/kg bw/d from Sax, 1984.	1	1	1	1	1	1	1	1	1	0.2
Selenium	SE	1.248	Diet of 4.8 ppm NEL for blood chemistry, growth, histopathology for 6 week study. LEL was 6.4 ppm. Convert with 0.26 kg/kg bw/d from EPA, 1993 for	1	1	1	1	1	1	1	1	1	1.2
Selenium	SE	0.57	LOAEL for reproductive effects	1	1	1	1	1	1	3	1	3	0.2
Selenium	SE	0.08	Maximum tolerated in diet is 2 ppm dwb (convert with 0.04 kg diet/kg bw (Sax, 1984)).	1	1	1	1	1	1	1	1	1	0.1
Selenium	SE	0.004	Nutritional requirement	1	1	1	1	1	1	1	1	1	0.004
Silver	AG	87.3	LEL for cardiac effects and 28.6% mortality for 18 week study with 900 ppm. Convert with 0.097 kg/kg bw/d from Wiseman, 1987.	1	1	1	1	7	1	1	1	7	12.5
Silver	AG	65	NOAEL for 12 week study.	1	1	1	1	1	1	1	1	1	65.0
Silver	AG	68	NOAEL for overt toxicity and growth depression. Fed diet with 2% silver acetate, converted with 0.034 kg/kg bw/d (Wiseman , 1987)	1	1	1	1	1	1	1	1	1	68.0
Sulfate	SO4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin	TCDD	0.0001	NOAEL (for mortality within 21 days in 3-d old chickens, 100 pg/g bw/d)	1	5	1	1	1	1	3	1	15	6.67E-06
2,3,7,8-Tetrachlorodibenzo-p-dioxin	TCDD	0.000001	NOAEL (for decreased fertility, 1 pg/g bw/d)	1	1	1	1	1	1	1	1	1	1.00E-06

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Table 7-25. Application of Uncertainty Factors to Develop NOAEL-Based TBVs (continued)

Analyte	Analtye Code	TBV (mg/kg bw/d)	Basis for TBV	Study Duration UFs: Acute (<14 d)	Sub acute (15-30d)	Chronic (>30 d)	LD50 or LC50	Study Endpoint UFs: TD lethal	TD non lethal	NOAEL lethal LOAEL nonlethal	NOAEL non lethal	TBV UFs	TBV adj (mg/kg bw/d)
2,3,7,8-Tetrachlorodibenzofuran	TCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	TCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene	TCLEE	14	90-day NOEL for weight gain.	1	1	1	1	1	1	1	1	1	14.0
Tetrachloroethylene	TCLEE	1067.8	LOAEL for chronic inhalation study. Decreased survival and caused cellular changes. Converted with rate of 0.126 m3/d from allometric equation (EPA, 1993) and assumed body weight of 0.16 kg.)	1	1	1	1	7	1	1	1	7	152.5
Tetrachloroethylene	TCLEE	20	LOAEL for hepatic damage.	1	1	1	1	1	1	3	1	3	6.7
Thallium	TL	23.7	LD50	10	1	1	10	1	1	1	1	100	0.2
Thallium	TL	15.8	LD50 range from 15.8 - 43.6 mg/kg bw/d.	10	1	1	10	1	1	1	1	100	0.2
Thallium	TL	5	LD50 ranges from 5 - 70 mg/kg bw.	10	1	1	10	1	1	1	1	100	0.1
Thallium	TL	6	Mice gavaged on gestational days 6-15 had postimplantation fetal loss and slight decrease in birth weight.	10	1	1	1	1	1	3	1	30	0.2
Thallium	TL	3	Rats gavaged on gestational days 6-15 had slight increase in postimplantation fetal loss.	10	1	1	1	1	1	3	1	30	0.1
Thallium	TL	5.7	Rats treated for 6 months lost hair, had ultrastructural changes in muscle tissue from Tl-acetate.	1	1	1	1	1	1	3	1	3	1.9
Thallium	TL	0.25	In 90-d study with oral gavage, NOAEL was 0.25 mg/kg bw/d for weight, food intake, hematology, clinical chemistry, neurology, and histopathology. No LOAEL as this was highest dose.	1	1	1	1	1	1	1	1	1	0.3
Thallium	TL	1.4	After treatment for 36 wk w/ Tl in drinking water, mortality was 21%.	1	1	1	1	7	1	1	1	7	0.2
Thallium	TL	1.275	Fed acetate and oxide forms for 15 wks; 30 ppm lethal to 100%. Mortality in 15 ppm treatment similar to controls. Use 15 ppm as NOAEL, 30 ppm as LOAEL. Use 0.085 g/g/d from Groton et al., 1991 to convert.	1	1	1	1	1	1	3	1	3	0.4
Toluene	MEC6H5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxins	THCDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxins	THCDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofurans	THCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofurans	THCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxins	THPCDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxins	THPCDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofurans	THPCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofurans	THPCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxins	TPCDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxins	TPCDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofurans	TPCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofurans	TPCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total petroleum hydrocarbons	TPHC	126	NOAEL of 20,000 ppm diet, 22 week study for mortality, body weight, food consumption, reproduction & hatching success. This was a LOAEL for serum chemistry, eggshell thickness. Converted with 0.063 kg/kg bw/d (EPA, 1993). 2000 ppm a NOAEL, all effects.	1	1	1	1	1	1	1	1	1	126.0
Total petroleum hydrocarbons	TPHC	5000	5 day NOAEL for serum chemistry. Minor effects noted were increased serum albumin, decreased spleen weight in treated females.	10	1	1	1	1	1	1	1	10	500.0
Total petroleum hydrocarbons	TPHC	16000	LD50 range for three crude oils exceeded highest test doses of >10 - 16 g/kg bw.	10	1	1	10	1	1	1	1	100	160.0
Total phosphates	TPO4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxins	TTCDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 7-25. Application of Uncertainty Factors to Develop NOAEL-Based TBVs (continued)

	Analyte	TBV		Study Duration UFs				Study Endpoint UFs					
				Acute	Sub acute	Chronic	LD50 or	TD	TD non	NOAEL lethal LOAEL	NOAEL non	TBV	TBV adj (mg/kg
Analyte	Code	(mg/kg bw/d)	Basis for TBV	(<14 d)	(15-30d)	(>30 d)	LC50	lethal	lethal	nonlethal	lethal	UFs	bw/d)
Total tetrachlorodibenzo-p-dioxins	TTCDD	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo furans	TTCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo furans	TTCDF	see TCDD	see TCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	111TCE	5700	LD50	10	1	1	10	1	1	1	1	100	57.0
Trichloroethylene	TRCLE	100	Increased liver weight in 6 week oral study.	1	1	1	1	1	1	3	1	3	33.3
Trichloroethylene	TRCLE	157	Increased liver weight, altered enzyme level, 200 mg/m3 converted with 0.126 m3/d from allometric equation (EPA, 1993) and assumed body weight of 0.16 kg.	1	1	1	1	1	1	3	1	3	52.3
Trichloroethylene	TRCLE	393	Alter urinary and hematological parameters in 4-6 month study from drinking water ingestion of 2500 mg/L.	1	1	1	1	1	1	3	1	3	131.0
1,3,5-Trinitrobenzene	135TNB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	246TNT	0.4	NOAEL for effects on spleen, liver, kidney, chronic lifetime test. Altered hematology in 2 mg/kg dose in 31.5% of the tested females.	1	1	1	1	1	1	1	1	1	0.4
2,4,6-Trinitrotoluene	246TNT	3	NOAEL for chronic lifetime study for body weight and other effects.	1	1	1	1	1	1	1	1	1	3.0
2,4,6-Trinitrotoluene	246TNT	0.5	NOAEL for lethality, food consumption for 26 wk study, did cause mild liver histopathological effects. One animal at 2 mg/kg bw/d had microscopic cirrhosis and hemosiderosis of the liver.	1	1	1	1	1	1	1	1	1	0.5
Vanadium	V	0.53	Tolerated by young ruminants.	1	1	1	1	1	1	1	1	1	0.5
Vanadium	V	20	20 mg/kg bw toxic within 3 days of administration for calves.	10	1	1	1	1	5	1	1	50	0.4
Vanadium	V	40	Limited study with few animals indicated 9.7 - 11.2 mg/kg bw toxic as defined by 75% decrease in feed intake. Alter dose during test. 40 mg/kg bw, single dose, was lethal to 2/3 sheep.	1	5	1	1	1	1	3	1	15	2.7
Vanadium	V	0.128	Brain enzyme activity reduced at 5.12 mg/kg /day; NEL was 0.128 mg/kg/d for 10-15 days. Not a clear population effect.	10	1	1	1	1	1	1	1	10	0.013
Vanadium	V	0.05	LEL for reflexes for 80 day feeding of aqueous solution 0.05-0.5 mg V/kg bw/d.	1	1	1	1	1	1	3	1	3	0.017
Xylenes	XYLEN	250	NOAEL, short term study (body weight, survival, hepatic). Converted with body weight of 0.16 kg, inhalation rate of 0.126 m3/d (EPA, 1993)	1	5	1	1	1	1	1	1	5	50.0
Xylenes	XYLEN	1000	NOAEL.	1	1	1	1	1	1	1	1	1	1000.0
m-Xylene	13DMB	see Xylenes	see Xylenes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ZN	23	Assumed based on nutritional requirements of 2.4-8.0 mg/kg bw/day for quail, ducks, chicken.	1	1	1	1	1	1	1	1	1	23.0
Zinc	ZN	189	Ducks fed 3000 ppm in diet had decreased gonad size, probably impairment of function. Overt toxicity after 20 days. Mortality high by 60 days. Convert with 0.063 g/g/d, EPA, 1993.	1	1	1	1	7	1	1	1	7	27.0
Zinc	ZN	97	Tolerate 1000 ppm in feed, but 1500 and above decreased growth. Carbonate >sulfate>oxide in toxicity. Convert w/ 0.097 g/g/d from Wiseman, 1987.	1	1	1	1	1	1	1	1	1	97.0
Zinc	ZN	291	Minimal mortality (15%) at 10 wks on diet with 5000 ppm. Mortality was 2.5% for 3000 ppm treatment; use this as NOAEL. Convert with 0.097 g/g/d from Wiseman, 1987.	1	1	1	1	7	1	1	1	7	41.6
Zinc	ZN	100	500 mg/L in drinking water causes histopathological changes. Convert with 0.2 L/kg bw/day from EPA, 1993. Use low UF because no direct link with population effects.	1	1	1	1	1	1	3	1	3	33.3
Zinc	ZN	170	0.2% in diet NOAEL for effects on fetus. 0.4% had reproductive effects. Study ranged from 16 to 40 days. Convert with 0.085 kg/kg bw/d from Groton et al.,	1	1	1	1	1	1	1	1	1	170.0
Zinc	ZN	850	1% in diet toxic to rats (850 mg/kg bw/d converted with 0.085 kg/kg bw/d from Groton et al., 1991).	1	1	1	1	1	5	1	1	5	170.0
Zinc	ZN	34	NOAEL based on 1000 ppm diet and ingestion rate of 0.034 kg/kg bw/d (Wiseman, 1987). Duration of study 14 - 17 wks.	1	1	1	1	1	1	1	1	1	34.0
Zinc	ZN	40	Maximum tolerated in diet 300-1000 ppm, dwb.	1	1	1	1	1	1	1	1	1	40.0
Zinc	ZN	5	No adverse effect on development of fetus when given to ewes during gestation.	1	1	1	1	1	1	1	1	1	5.0

Note.-For acronym and abbreviation definitions, see the Acronyms and Abbreviations list located behind the Table of Contents.

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Table 7-26. Dioxin/Furan Toxicity Equivalency Factors (TEFs) Used in the SWERA

ANALYTE	IRDMIS ANALYTE CODE	DESCRIPTION	TEF
1234678-HPCDD	678HPD	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01
1234678-HPCDF	678HPF	1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01
1234789-HPCDF	789HPF	1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.001
123478-HXCDD	78HXDD	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1
123478-HXCDF	78HXDF	1,2,3,4,7,8-Hexachlorodibenzofuran	0.001
123678-HXCDD	678HXD	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1
123678-HXCDF	678HXF	1,2,3,6,7,8-Hexachlorodibenzofuran	0.001
123789-HXCDD	789HXD	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.001
123789-HXCDF	789HXF	1,2,3,7,8,9-Hexachlorodibenzofuran	0.001
12378-PECDD	78PCDD	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.5
12378-PECDF	78PCDF	1,2,3,7,8-Pentachlorodibenzofuran	0.05
234678-HXCDF	234HXF	2,3,4,6,7,8-Hexachlorodibenzofuran	0.1
23478-PECDF	234PCF	2,3,4,7,8-Pentachlorodibenzofuran	0.5
2378-TCDF	TCDF	2,3,7 8-Tetrachlorodibenzofuran	0.1
2378-TCDD	TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin	1
OCDD	OCDD	Octachlorodibenzodioxin	0.001
OCDF	OCDF	Octachlorodibenzofuran	0.001
TOTAL HPCDD	THPCDD	Total Heptachlorodibenzodioxins	0.01
TOTAL HPCDF	THPCDF	Total Heptachlorodibenzofurans	0.01
TOTAL HXCDD	THCDD	Total Hexachlorodibenzodioxins	0.1
TOTAL HXCDF	THCDF	Total Hexachlorodibenzofurans	0.1
TOTAL PECDD	TPCDD	Total Pentachlorodibenzodioxins	0.5
TOTAL PECDF	TPCDF	Total Pentachlorodibenzofurans	0.5
TOTAL TCDD	TTCDD	Total Tetrachlorodibenzodioxins	1
TOTAL TCDF	TTCDF	Total Tetrachlorodibenzofurans	0.1

Reference: Estimating Exposure to Dioxin like Compounds, Review Draft (Do Not Cite or Quote), Volume III: Site Specific Assessment Procedures, (EPA, June 1994).
Reference: "Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxin and Dibenzofurans (PCDDs and PCDFs) and 1989 Update (EPA/625/3-89-016, March 1989).

Table 7-27. Final TBVs for Avian and Mammalian Receptors

Analyte	Analtye Code	Final TBVs (mg/kg bw/day) PASS[a]	AK[b]	GHO[c]	GE[d]	BE[e]	DM[f]	MD[g]	JR[h]	KF[i]	MDK[j]	SB[k]	Reference
Acenaphthene	ANAPNE	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Acetone	ACET	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	ACLDAN	2.82	2.82	2.82	1.41	1.41	NA	NA	NA	NA	NA	NA	USEPA (Hudson et al., 1984)
alpha-Chlordane	ACLDAN	NA	NA	NA	NA	NA	0.24	0.24	0.24	0.12	NA	NA	USEPA, 1984
Aluminum	AL	NA	NA	NA	NA	NA	16.67	13.33	16.67	6.67	NA	NA	Friberg et al., 1979
Anthracene	ANTRC	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Antimony	SB	NA	NA	NA	NA	NA	0.20	0.12	0.12	0.06	NA	NA	Friberg et al., 1979
Arsenic	AS	2.80	2.80	2.80	1.40	1.40	NA	NA	NA	NA	14.00	2.80	Camardese et al., 1990; Whitworth et al., 1991
Arsenic	AS	NA	NA	NA	NA	NA	1.27	0.76	0.76	0.38	NA	NA	Schroeder et al., 1968
Barium	BA	19.40	19.40	19.40	9.70	9.70	NA	NA	NA	NA	19.40	19.40	Johnson et al., 1960
Barium	BA	NA	NA	NA	NA	NA	3.96	2.37	2.37	1.19	NA	NA	Perry et al., 1989
Benzo(a)anthracene	BAANTR	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Benzo(a)pyrene	BAPYR	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	Opresko et al., 1993
Benzo(b) Fluoranthene	BBFANT	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Benzo(ghi)perylene	BGHIPY	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Benzo(k)fluoranthene	BKFANT	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Benzyl alcohol	BZALC	0.20	0.20	0.20	0.10	0.10	NA	NA	NA	NA	NA	NA	RTECS
Benzyl alcohol	BZALC	NA	NA	NA	NA	NA	2.08	2.08	5.20	1.04	NA	NA	RTECS
Beryllium	BE	19.40	19.40	19.40	9.70	9.70	NA	NA	NA	NA	19.40	19.40	Friberg et al., 1979
Beryllium	BE	NA	NA	NA	NA	NA	14.17	8.50	8.50	4.25	NA	NA	WHO, 1990b
Bis(2-ethylhexyl) phthalate	B2EHP	2.08	2.08	2.08	1.04	1.04	NA	NA	NA	NA	2.08	2.08	WHO, 1992
Bis(2-ethylhexyl) phthalate	B2EHP	NA	NA	NA	NA	NA	34.00	20.40	20.40	10.20	NA	NA	WHO, 1992
Butylbenzyl phthalate	BBZP	2.08	2.08	2.08	1.04	1.04	NA	NA	NA	NA	NA	NA	see B2EHP for birds
Butylbenzyl phthalate	BBZP	NA	NA	NA	NA	NA	34.00	20.40	20.40	10.20	NA	NA	see B2EHP for mammals
Cadmium	CD	0.13	0.13	0.13	0.07	0.07	NA	NA	NA	NA	0.67	0.13	Cain et al., 1983; White and Finley, 1978
Cadmium	CD	NA	NA	NA	NA	NA	0.83	0.50	0.50	0.25	NA	NA	Groten et al., 1991
Chloromethane	CH3CL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	CHCL3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (III)	CR	0.26	0.26	0.26	0.13	0.13	NA	NA	NA	NA	0.26	0.32	CEPA, 1994b
Chromium (III)	CR	NA	NA	NA	NA	NA	4.00	4.00	4.00	2.50	NA	NA	NAS, 1974a
Chromium (VI)	CRHEX	0.26	0.26	0.26	0.13	0.13	NA	NA	NA	NA	0.26	0.32	See Chromium III
Chromium (VI)	CRHEX	NA	NA	NA	NA	NA	4.00	4.00	4.00	2.50	NA	NA	See Chromium III
Chlordane	CLDAN	2.82	2.82	2.82	1.41	1.41	NA	NA	NA	NA	NA	NA	See ACLDAN
Chlordane	CLDAN	NA	NA	NA	NA	NA	0.24	0.24	0.24	0.12	NA	NA	See ACLDAN
Chrysene	CHRY	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see BAP
Cobalt	CO	168.00	168.00	168.00	84.00	84.00	NA	NA	NA	NA	420.00	168.00	EPA, 1993; Friberg et al., 1979 :DIR (g/gbw/d) =(0.495 Wt^(0.704))/BW
Cobalt	CO	NA	NA	NA	NA	NA	0.08	0.05	0.05	0.02	NA	NA	Domingo, 1994
Copper	CU	11.06	11.06	11.06	5.53	5.53	NA	NA	NA	NA	11.06	11.06	Mehring et al., 1960
Copper	CU	NA	NA	NA	NA	NA	1.57	1.57	1.57	0.98	NA	NA	Aulerich et al., 1982
Cyclotetramethylene tetranitramine (HMX)	HMX	NA	NA	NA	NA	NA	2.00	1.20	1.20	0.60	NA	NA	Everett et al., 1985
Dibenzo(a,h)anthracene	DBAHA	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Dibenzofuran	DBZFUR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 7-27. Final TBVs for Avian and Mammalian Receptors (continued)

Analyte	Analtye Code	PASS[a]	AK[b]	GHO[c]	GE[d]	BE[e]	DM[f]	MD[g]	JR[h]	KF[i]	MDK[j]	SB[k]	Reference
		Final TBVs (mg/kg bw/day)											
Dichlorobenzene-nonspecific	DCLB	NA	NA	NA	NA	NA	1.25	1.00	1.00	0.50	NA	NA	see 1,2 DCB
Dibutyl phthalate	DNBP	2.08	2.08	2.08	1.04	1.04	NA	NA	NA	NA	NA	NA	see B2EHP
Dibutyl phthalate	DNBP	NA	NA	NA	NA	NA	34.00	20.40	20.40	10.20	NA	NA	see B2EHP
Dioctyl phthalate	DNOP	2.08	2.08	2.08	1.04	1.04	NA	NA	NA	NA	NA	NA	see B2EHP
Dioctyl phthalate	DNOP	NA	NA	NA	NA	NA	34.00	20.40	20.40	10.20	NA	NA	see B2EHP
1,2-Dichlorobenzene	12DCLB	NA	NA	NA	NA	NA	1.25	1.00	1.00	0.50	NA	NA	CEPA, 1993a
1,3-Dichlorobenzene	13DCLB	NA	NA	NA	NA	NA	1.25	1.00	1.00	0.50	NA	NA	Use 12DCLB
1,4-Dichlorobenzene	14DCLB	NA	NA	NA	NA	NA	1.25	1.00	1.00	0.50	NA	NA	Use 12DCLB
2,4-Dichlorophenoxy acetic acid	24D	NA	NA	NA	NA	NA	0.20	0.20	0.20	0.17	NA	NA	Sax, 1992
Dieldrin	DLDRN	0.10	0.10	0.13	0.05	0.05	NA	NA	NA	NA	NA	NA	Mendenhall et al., 1983
Dieldrin	DLDRN	NA	NA	NA	NA	NA	0.01	0.01	0.01	0.01	NA	NA	Walker et al., 1969
Dimethyl phthalate	DMP	2.08	2.08	2.08	1.04	1.04	NA	NA	NA	NA	NA	NA	see B2EHP for birds
Dimethyl phthalate	DMP	NA	NA	NA	NA	NA	34.00	20.40	20.40	10.20	NA	NA	see B2EHP for mammals
2,4 Dinitrotoluene	24DNT	NA	NA	NA	NA	NA	0.06	0.06	0.06	0.05	NA	NA	Lee et al., 1975
Endosulfan II	BENSLF	0.06	0.06	0.06	0.03	0.03	NA	NA	NA	NA	NA	NA	see Endosulfan I
Endrin	ENDRN	0.0021	0.0021	0.0021	0.0011	0.0011	NA	NA	NA	NA	NA	NA	Roylance et al., 1985
Endrin	ENDRN	NA	NA	NA	NA	NA	0.362	0.362	0.362	0.181	NA	NA	Blus, 1978
Endrin Aldehyde	ENDRNA	NA	NA	NA	NA	NA	0.362	0.362	0.362	0.181	NA	NA	see endrin
Ethylbenzene	ETC6H5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	FANT	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see BAP
Fluorene	FLRENE	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see BAP
Fluoride	F	NA	NA	NA	NA	NA	1.07	0.64	0.64	0.32	NA	NA	CEPA, 1993g
gamma-BHC (Lindane)	LIN	0.06	0.06	0.06	0.03	0.03	NA	NA	NA	NA	NA	NA	Ritchey et al., 1972
Heptachlor	HPCL	0.06	0.06	0.06	0.03	0.03	NA	NA	NA	NA	NA	NA	Ritchey et al., 1972
Heptachlor Epoxide	HPCLE	0.06	0.06	0.06	0.03	0.03	NA	NA	NA	NA	NA	NA	See heptachlor
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	678HPD	1.33E-04	1.33E-04	1.33E-04	6.67E-05	6.67E-05	NA	NA	NA	NA	NA	NA	see TCDD
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	678HPD	NA	NA	NA	NA	NA	3.33E-05	2.00E-05	2.00E-05	1.00E-05	NA	NA	see TCDD
1,2,3,4,6,7,8-Heptachlorodibenzofuran	678HPF	1.33E-04	1.33E-04	1.33E-04	6.67E-05	6.67E-05	NA	NA	NA	NA	NA	NA	see TCDD
1,2,3,4,6,7,8-Heptachlorodibenzofuran	678HPF	NA	NA	NA	NA	NA	3.33E-05	2.00E-05	2.00E-05	1.00E-05	NA	NA	see TCDD
1,2,3,4,7,8,9-Heptachlorodibenzofuran	789HPF	1.33E-03	1.33E-03	1.33E-03	6.67E-04	6.67E-04	NA	NA	NA	NA	NA	NA	see TCDD
1,2,3,4,7,8,9-Heptachlorodibenzofuran	789HPF	NA	NA	NA	NA	NA	3.33E-04	2.00E-04	2.00E-04	1.00E-04	NA	NA	see TCDD
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	678HXD	1.33E-05	1.33E-05	1.33E-05	6.67E-06	6.67E-06	NA	NA	NA	NA	NA	NA	see TCDD
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	678HXD	NA	NA	NA	NA	NA	3.33E-06	2.00E-06	2.00E-06	1.00E-06	NA	NA	see TCDD
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	789HXD	1.33E-03	1.33E-03	1.33E-03	6.67E-04	6.67E-04	NA	NA	NA	NA	NA	NA	see TCDD
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	789HXD	NA	NA	NA	NA	NA	3.33E-04	2.00E-04	2.00E-04	1.00E-04	NA	NA	see TCDD
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	78HXDD	1.33E-05	1.33E-05	1.33E-05	6.67E-06	6.67E-06	NA	NA	NA	NA	NA	NA	see TCDD
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	78HXDD	NA	NA	NA	NA	NA	3.33E-06	2.00E-06	2.00E-06	1.00E-06	NA	NA	see TCDD
2,3,4,6,7,8-Hexachlorodibenzofuran	234HXF	1.33E-05	1.33E-05	1.33E-05	6.67E-06	6.67E-06	NA	NA	NA	NA	NA	NA	see TCDD
2,3,4,6,7,8-Hexachlorodibenzofuran	234HXF	NA	NA	NA	NA	NA	3.33E-06	2.00E-06	2.00E-06	1.00E-06	NA	NA	see TCDD
1,2,3,6,7,8-Hexachlorodibenzofuran	678HXF	1.33E-03	1.33E-03	1.33E-03	6.67E-04	6.67E-04	NA	NA	NA	NA	NA	NA	see TCDD
1,2,3,6,7,8-Hexachlorodibenzofuran	678HXF	NA	NA	NA	NA	NA	3.33E-04	2.00E-04	2.00E-04	1.00E-04	NA	NA	see TCDD
1,2,3,4,7,8-Hexachlorodibenzofuran	78HXDF	1.33E-03	1.33E-03	1.33E-03	6.67E-04	6.67E-04	NA	NA	NA	NA	NA	NA	see TCDD
1,2,3,4,7,8-Hexachlorodibenzofuran	78HXDF	NA	NA	NA	NA	NA	3.33E-04	2.00E-04	2.00E-04	1.00E-04	NA	NA	see TCDD
Indeno(1,2,3-cd)pyrene	ICDPYR	NA	NA	NA	NA	NA	1.11E+00	6.67E-01	6.67E-01	3.33E-01	NA	NA	see Benzo(a)pyrene
Iron	FE	78.00	78.00	78.00	39.00	39.00	NA	NA	NA	NA	78.00	78.00	Wiseman, 1987
Iron	FE	NA	NA	NA	NA	NA	6.52	3.91	3.91	1.96	NA	NA	Schlicker and Cox, 1968

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Table 7-27. Final TBVs for Avian and Mammalian Receptors (continued)

Analyte	Analtye Code	Final TBVs (mg/kg bw/day) PASS[a]	AK[b]	GHO[c]	GE[d]	BE[e]	DM[f]	MD[g]	JR[h]	KF[i]	MDK[j]	SB[k]	Reference
Lead	PB	2.90	14.50	2.90	1.81	1.81	NA	NA	NA	NA	2.90	2.90	Franson et al., 1983; Pattee, 1984; Hoffman et al., 1985
Lead (acetate)	PBORG	NA	NA	NA	NA	NA	1.33	0.80	0.80	0.40	NA	NA	Azar et al., 1973
Manganese	MN	82.00	82.00	82.00	41.00	41.00	NA	NA	NA	NA	82.00	82.00	Wiseman, 1987
Manganese	MN	NA	NA	NA	NA	NA	22.22	13.33	13.33	6.67	NA	NA	NTP, 1993
2-Methylnapthalene	2MNAP	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Mercury	HG	0.50	0.50	0.50	0.25	0.25	NA	NA	NA	NA	0.50	0.50	Thaxton et al., 1975; Thaxton and Parkhurst, 1973; Nicholson and Osborn, 1984.
Mercury	HG	NA	NA	NA	NA	NA	0.33	0.26	0.26	0.13	NA	NA	Mitsumori et al., 1981
Naphthalene	NAP	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Nickel	NI	5.82	5.82	5.82	2.91	2.91	NA	NA	NA	NA	5.82	5.82	Venugopal and Luckey, 1978.
Nickel	NI	NA	NA	NA	NA	NA	10.53	6.32	6.32	3.16	NA	NA	RTECs, 1996
Nitrate, nitrite-nonspecific	NIT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NO3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	NO2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NB	NA	NA	NA	NA	NA	0.38	0.30	0.30	0.15	NA	NA	IRIS
N-Nitrosodiphenyl amine	NNDPA	NA	NA	NA	NA	NA	444.44	266.67	266.67	133.33	NA	NA	HSDB
Octachlorodibenzodioxin	OCDD	1.33E-03	1.33E-03	1.33E-03	6.67E-04	6.67E-04	NA	NA	NA	NA	NA	NA	See TCDD
Octachlorodibenzodioxin	OCDD	NA	NA	NA	NA	NA	3.33E-04	2.00E-04	2.00E-04	1.00E-04	NA	NA	See TCDD
Octachlorodibenzofuran	OCDF	1.33E-03	1.33E-03	1.33E-03	6.67E-04	6.67E-04	NA	NA	NA	NA	NA	NA	see TCDD
Octachlorodibenzofuran	OCDF	NA	NA	NA	NA	NA	3.33E-04	2.00E-04	2.00E-04	1.00E-04	NA	NA	see TCDD
PCB-1248	PCB248	0.04	0.04	0.04	0.02	0.02	NA	NA	NA	NA	NA	NA	See PCB1254
PCB-1248	PCB248	NA	NA	NA	NA	NA	0.14	0.11	0.11	0.06	NA	NA	See PCB1254
PCB-1254	PCB254	0.04	0.04	0.04	0.02	0.02	NA	NA	NA	NA	NA	NA	Dahlgren et al., 1972
PCB-1254	PCB254	NA	NA	NA	NA	NA	0.14	0.11	0.11	0.06	NA	NA	Linzey, 1988
PCB-1260	PCB1260	0.04	0.04	0.04	0.02	0.02	NA	NA	NA	NA	NA	NA	See PCB1254
PCB-1260	PCB1260	NA	NA	NA	NA	NA	0.14	0.11	0.11	0.06	NA	NA	See PCB1254
2,3,4,7,8-Pentachlorodibenzofuran	234PCF	2.67E-06	2.67E-06	2.67E-06	1.33E-06	1.33E-06	NA	NA	NA	NA	NA	NA	See TCDD
2,3,4,7,8-Pentachlorodibenzofuran	234PCF	NA	NA	NA	NA	NA	6.67E-07	4.00E-07	4.00E-07	2.00E-07	NA	NA	See TCDD
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	78PCDD	2.67E-06	2.67E-06	2.67E-06	1.33E-06	1.33E-06	NA	NA	NA	NA	NA	NA	See TCDD
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	78PCDD	NA	NA	NA	NA	NA	6.67E-07	4.00E-07	4.00E-07	2.00E-07	NA	NA	See TCDD
1,2,3,7,8-Pentachlorodibenzofuran	78PCDF	2.67E-05	2.67E-05	2.67E-05	1.33E-05	1.33E-05	NA	NA	NA	NA	NA	NA	See TCDD
1,2,3,7,8-Pentachlorodibenzofuran	78PCDF	NA	NA	NA	NA	NA	6.67E-06	4.00E-06	4.00E-06	2.00E-06	NA	NA	See TCDD
Pentaerythritol tetranitrate (PETN)	PETN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	PHANTR	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see Benzo(a)pyrene
Phenol	PHENOL	NA	NA	NA	NA	NA	20.00	12.00	12.00	6.00	NA	NA	IRIS
Phosphate	PO4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ppDDD	PPDDD	0.02	0.02	0.02	0.02	0.05	NA	NA	NA	NA	NA	NA	see DDT
ppDDD	PPDDD	NA	NA	NA	NA	NA	2.13	1.70	1.70	0.85	NA	NA	see DDT
ppDDE	PPDDE	0.02	0.02	0.02	0.02	0.05	NA	NA	NA	NA	NA	NA	Mendenhall et al., 1983
ppDDE	PPDDE	NA	NA	NA	NA	NA	2.13	1.70	1.70	0.85	NA	NA	see DDT
ppDDT	PPDDT	0.02	0.02	0.02	0.02	0.05	NA	NA	NA	NA	NA	NA	Chura and Stewart, 1967; Stickel et al., 1966
ppDDT	PPDDT	NA	NA	NA	NA	NA	2.13	1.70	1.70	0.85	NA	NA	Turasov et al., 1973
Pyrene	PYR	NA	NA	NA	NA	NA	1.11	0.67	0.67	0.33	NA	NA	see BAP
RDX (Cyclonite)	RDX	NA	NA	NA	NA	NA	0.07	0.04	0.04	0.02	NA	NA	MacPhail et al., 1985

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Table 7-27. Final TBVs for Avian and Mammalian Receptors (continued)

Analyte	Analtye Code	PASS[a]	AK[b]	GHO[c]	GE[d]	BE[e]	DM[f]	MD[g]	JR[h]	KF[i]	MDK[j]	SB[k]	Reference
		Final TBVs (mg/kg bw/day)											
Selenium	SE	0.13	0.13	0.13	0.07	0.07	NA	NA	NA	NA	0.13	0.13	Ort and Latshaw, 1978
Selenium	SE	NA	NA	NA	NA	NA	0.05	0.04	0.04	0.02	NA	NA	Opresko et al., 1993
Silver	AG	2.49	2.49	2.49	1.25	1.25	NA	NA	NA	NA	2.49	2.49	Friberg et al., 1979
Silver	AG	NA	NA	NA	NA	NA	13.60	17.00	13.60	6.80	NA	NA	Van Vleet, 1976
Sulfate	SO4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin	TCDD	1.33E-06	1.33E-06	1.33E-06	6.67E-07	6.67E-07	NA	NA	NA	NA	NA	NA	Schwetz et al., 1973
2,3,7,8-Tetrachlorodibenzo-p-dioxin	TCDD	NA	NA	NA	NA	NA	3.33E-07	2.00E-07	2.00E-07	1.00E-07	NA	NA	Murray et al., 1979
2,3,7,8-Tetrachlorodibenzo furan	TCDF	1.33E-05	1.33E-05	1.33E-05	6.67E-06	6.67E-06	NA	NA	NA	NA	NA	NA	see TCDD
2,3,7,8-Tetrachlorodibenzo furan	TCDF	NA	NA	NA	NA	NA	2.50E-06	2.00E-06	2.00E-06	1.00E-06	NA	NA	see TCDD
Tetrachloroethylene	TCLEE	NA	NA	NA	NA	NA	4.67	2.80	2.80	1.40	NA	NA	CEPA, 1993e
Thallium	TL	0.05	0.05	0.05	0.02	0.02	NA	NA	NA	NA	0.05	0.05	Hudson et al., 1984
Thallium	TL	NA	NA	NA	NA	NA	0.03	0.02	0.02	0.01	NA	NA	Roll and Matthiaschk, 1981
Toluene	MEC6H5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxins	THCDD	1.33E-05	1.33E-05	1.33E-05	6.67E-06	6.67E-06	NA	NA	NA	NA	NA	NA	see TCDD
Total hexachlorodibenzo-p-dioxins	THCDD	NA	NA	NA	NA	NA	3.33E-07	2.00E-07	2.00E-07	1.00E-07	NA	NA	see TCDD
Total hexachlorodibenzo furans	THCDF	1.33E-05	1.33E-05	1.33E-05	6.67E-06	6.67E-06	NA	NA	NA	NA	NA	NA	see TCDD
Total hexachlorodibenzo furans	THCDF	NA	NA	NA	NA	NA	3.33E-07	2.00E-07	2.00E-07	1.00E-07	NA	NA	see TCDD
Total heptachlorodibenzo-p-dioxins	THPCDD	1.33E-04	1.33E-04	1.33E-04	6.67E-05	6.67E-05	NA	NA	NA	NA	NA	NA	see TCDD
Total heptachlorodibenzo-p-dioxins	THPCDD	NA	NA	NA	NA	NA	3.33E-07	2.00E-07	2.00E-07	1.00E-07	NA	NA	see TCDD
Total heptachlorodibenzo furans	THPCDF	1.33E-04	1.33E-04	1.33E-04	6.67E-05	6.67E-05	NA	NA	NA	NA	NA	NA	see TCDD
Total heptachlorodibenzo furans	THPCDF	NA	NA	NA	NA	NA	3.33E-07	2.00E-07	2.00E-07	1.00E-07	NA	NA	see TCDD
Total pentachlorodibenzo-p-dioxins	TPCDD	2.67E-06	2.67E-06	2.67E-06	1.33E-06	1.33E-06	NA	NA	NA	NA	NA	NA	see TCDD
Total pentachlorodibenzo-p-dioxins	TPCDD	NA	NA	NA	NA	NA	3.33E-07	2.00E-07	2.00E-07	1.00E-07	NA	NA	see TCDD
Total pentachlorodibenzo furans	TPCDF	2.67E-06	2.67E-06	2.67E-06	1.33E-06	1.33E-06	NA	NA	NA	NA	NA	NA	see TCDD
Total pentachlorodibenzo furans	TPCDF	NA	NA	NA	NA	NA	3.33E-07	2.00E-07	2.00E-07	1.00E-07	NA	NA	see TCDD
Total petroleum hydrocarbons	TPHC	25.20	25.20	25.20	12.60	12.60	NA	NA	NA	NA	NA	NA	Stubblefield et al., 1995a
Total petroleum hydrocarbons	TPHC	NA	NA	NA	NA	NA	100.00	100.00	100.00	62.50	NA	NA	Stubblefield et al., 1995b
Total phosphates	TPO4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxins	TTCDD	1.33E-06	1.33E-06	1.33E-06	6.67E-07	6.67E-07	NA	NA	NA	NA	NA	NA	see TCDD
Total tetrachlorodibenzo furans	TTCDD	NA	NA	NA	NA	NA	3.33E-07	2.00E-07	2.00E-07	1.00E-07	NA	NA	see TCDD
Total tetrachlorodibenzo furans	TTCDF	1.33E-05	1.33E-05	1.33E-05	6.67E-06	6.67E-06	NA	NA	NA	NA	NA	NA	see TCDD
Total tetrachlorodibenzo furans	TTCDF	NA	NA	NA	NA	NA	3.33E-06	2.00E-06	2.00E-06	1.00E-06	NA	NA	see TCDD
1,1,1-Trichloroethane	111TCE	NA	NA	NA	NA	NA	19.00	11.40	28.50	5.70	NA	NA	Jorgensen et al., 1991
Trichloroethylene	TRCLE	NA	NA	NA	NA	NA	8.33	6.67	6.67	3.33	NA	NA	CEPA, 1993f
2,4,6-Trinitrotoluene	246TNT	NA	NA	NA	NA	NA	0.10	0.10	0.10	0.08	NA	NA	Levine et al., 1983
Vanadium	V	NA	NA	NA	NA	NA	0.53	0.67	0.53	0.27	NA	NA	Hansard et al., 1982
Xylenes	XYLEN	NA	NA	NA	NA	NA	16.67	10.00	10.00	5.00	NA	NA	CEPA, 1993c
m-Xylene	13DMB	NA	NA	NA	NA	NA	16.67	10.00	10.00	5.00	NA	NA	see Xylenes
Zinc	ZN	5.40	5.40	5.40	2.70	2.70	NA	NA	NA	NA	27.00	5.40	Gasaway and Buss, 1972
Zinc	ZN	NA	NA	NA	NA	NA	6.80	8.50	6.80	3.40	NA	NA	Sutton and Nelson, 1937

[a]Pass = Passerine birds.
[b]AK = American Kestrel.
[c]GHO = Great Horned Owl.
[d]GE = Golden Eagle.
[e]BE = Bald Eagle.
[f]DM = Deer Mouse.
[g]MD = Mule Deer.
[h]JR = Jackrabbit.
[i]KF = Kit Fox.
[j]MDK = Mallard Duck.
[k]SB = Shore Bird.

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Table 7-28. Final Toxicity Benchmark Values (TBVs) for Plants and Soil Fauna

Analyte	Analtye Code	Species	TBV (mg/kg)	Endpoint Description	Reference	Comment
Acenaphthene	ANAPNE	Lettuce	25	EC50 for inhibition of growth relative to control for 14 d study	Hulzebos et al., 1993	Primary reference
Acenaphthene	ANAPNE	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Acetone	ACET		NA	NA	NA	NA
alpha-Chlordane	ACLDAN		NA	NA	NA	NA
Aluminum	AL	Wheat	730	At soil pH <5, relative root length decreased 80% that of controls. Expected to be less toxic in neutral, alkaline soils.	Wright et al., 1989	Primary reference. Receptor related to site receptors.
Aluminum	AL	Woodlouse	2800	55 - 75% survival over 6 - 12 weeks at 2500 - 2800 mg/kg soil	ICF, 1989	Only value
Anthracene	ANTRC	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Anthracene	ANTRC	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Antimony	SB	Plants	5	Recommended benchmark value	Suter et al., 1995	Only value
Arsenic	AS	Plants	10	Recommended benchmark value. AsV at this concentration may suppress growth in some species; AsIII suppresses growth at 25 mg/kg..	Suter et al., 1995; CEPA, 1993	Toxicity data consistent between studies.
Arsenic	AS	Earthworm	60	Recommended benchmark value	Suter et al, 1995	
Barium	BA	Plants	500	Recommended benchmark value	Suter et al., 1995	Only value
Benzo(a)anthracene	BAANTR	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Benzo(a)anthracene	BAANTR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Benzo(a)pyrene	BAPYR	Corn, soya, wheat	50	Stimulates growth. Levels above this inhibit growth.	CEPA, 1994a	Only BAP plant value
Benzo(a)pyrene	BAPYR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Benzo(b)fluoranthene	BBFANT	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Benzo(b)fluoranthene	BBFANT	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Benzo(ghi)perylene	BGHIPY	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Benzo(ghi)perylene	BGHIPY	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Benzo(k)fluoranthene	BKFANT	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Benzo(k)fluoranthene	BKFANT	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Beryllium	BE	Barley	10	Decreased yield by 26% in sandy soil; expect less response under alkaline conditions.	WHO 1990b	Data consistent.
Bis(2-ethylhexyl) phthalate	B2EHP	Spinach, pea	100	NEL	WHO, 1992a	Other studies provide test concentrations with effects
Butylbenzyl phthalate	BBZP	Spinach, pea	100	Use B2EHP	Use B2EHP	Use B2EHP
Cadmium	CD	Plants	3	Recommended benchmark value	Suter et al, 1995	
Cadmium	CD	Earthworm	20	Threshold for adverse effects on growth and sexual maturation	ICF, 1989	Less uncertainty in estimate.
Chloromethane	CH3CL	NA	NA	NA	NA	NA
Chloroform	CR	NA	NA	NA	NA	NA
Chromium (III)	CR	Orange	75	NEL; 150 ppm in soil phytotoxic.	NAS 1974a	Data indicate plants require at least 5 ppm, but 150 ppm toxic. Use this as NEL.
Chromium	CR	Earthworm	0.4	Recommended benchmark value	Suter et al, 1995	

Table 7-28. *Final Toxicity Benchmark Values (TBVs) for Plants and Soil Fauna (continued)*

Analyte	Analtye Code	Species	TBV (mg/kg)	Endpoint Description	Reference	Comment
Chrysene	CHRY	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Chrysene	CHRY	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Cobalt	CO	Plants	20	Recommended benchmark value	Suter et al., 1995	Data indicate 75 ppm in soil phytotoxic.
Copper	CU	Plants	100	Phytotoxic level in soils	ICF, 1989	Lower values may cause deficiency. Possibly higher values suitable.
Copper	CU	Isopods	83.8	NEL for adverse effects on population although individual effects (fewer gravid females, decreased size) observed.	Donker et al., 1993	Data consistent in that 60-84 ppm NEL; levels above 400 alter function. This endpoint closest to assessment endpoints.
Cyclotetramethylenetetranitramine	HMX	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	DBAHA	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Dibenzo(a,h)anthracene	DBAHA	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Dibenzofuran	DBZFUR	NA	NA	NA	NA	
Dichlorobenzene-nonspecific	DCLB	NA	NA	NA	NA	
Di-n-butyl phthalate	DNBP	Plants	200	Recommended benchmark value	Suter et al, 1995	
Di-n-octyl phthalate	DNOP	Plants	NA	NA	NA	NA
Di-n-octyl phthalate	DNOP	Soil fauna	NA	NA	NA	NA
1,2-Dichlorobenzene	12DCLB	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	13DCLB	NA	NA	NA	NA	
1,4-Dichlorobenzene	14DCLB	NA	NA	NA	NA	
2,4-Dichlorophenoxy acetic acid	24D	NA	NA	NA	NA	
Dieldrin	DLDRN	Earthworm	50	NOEC for growth or sexual maturation	ICF, 1989	
Dimethyl phthalate	DMP	Spinach, pea	100	Use B2EHP	Use B2EHP	Use B2EHP
2,4 Dinitrotoluene	24DNT	Lettuce	1000	EC50 for inhibition of growth relative to control >1000 mg/kg for 14 day study	Hulzebos et al., 1993	
Endosulfan II	ENDRN	NA	NA	NA	NA	
Endrin	ENDRN	NA	NA	NA	NA	
Endrin Aldehyde	ENDRNA	NA	NA	NA	NA	
Ethylbenzene	ETC6H5	NA	NA	NA	NA	
Fluoranthene	FANT	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Fluoranthene	FANT	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Fluorene	FLRENE	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Fluorene	FLRENE	Earthworm	173	LC50	ICF, 1989	
Fluoride	F	NA	NA	NA	NA	
gamma-BHC (Lindane)	LIN	NA	NA	NA	NA	
gamma-Chlordane	GCLDAN	NA	NA	NA	NA	

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Table 7-28. *Final Toxicity Benchmark Values (TBVs) for Plants and Soil Fauna (continued)*

Analyte	Analtye Code	Species	TBV (mg/kg)	Endpoint Description	Reference	Comment
Heptachlor	HPCL	NA	NA	NA	NA	
Heptachlor Epoxide	HPCLE	NA	NA	NA	NA	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	678HPD	NA	NA	NA	NA	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	789HPF	NA	NA	NA	NA	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	789HXD	NA	NA	NA	NA	
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	78HXDD	NA	NA	NA	NA	
2,3,4,6,7,8-Hexachlorodibenzofuran	234HXF	NA	NA	NA	NA	
1,2,3,6,7,8-Hexachlorodibenzofuran	678HXF	NA	NA	NA	NA	
1,2,3,4,7,8-Hexachlorodibenzofuran	78HXDF	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	ICDPYR	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Indeno(1,2,3-cd)pyrene	ICDPYR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Iron	FE	Plants	NA	Iron limiting under alkaline conditions.	Mortvedt 1991	
Iron	FE	Woodlice species	1000	Significant increase in respiratory rate	ICF, 1989	
Lead	PB	Plants	494	Phytotoxicity of soils is probable above this level	EPA, 1992	Median from data summarized by EPA, 1992
Lead	PB	Isopods	606	NEL for adverse effects on population although individual effects (fewer gravid females, decreased size) observed.	Donker et al., 1993	Primary reference; study endpoint is equivalent to assessment endpoint.
Manganese	MN	Plants	500	Recommended benchmark value	Suter et al., 1995	Only value
2-Methylnapthalene	2MNAP	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
2-Methylnapthalene	2MNAP	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Mercury	HG	Plants	0.3	Recommended benchmark value	Suter et al., 1995	
Mercury	HG	Earthworms	1	NEL for normal regeneration. LEL was 5 mg/kg.	Eisler, 1987	
Naphthalene	NAP	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Naphthalene	NAP	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Nickel	NI	Wheat	250	Decrease growth by 25% in calcareous soils. In acid soil, same effect at 110 mg/kg.	CEPA, 1994c	Test species similar to receptors; soils at site neutral to alkaline
Nickel	NI	Earthworms	200	Recommended benchmark value	Suter et al, 1995	

Table 7-28. *Final Toxicity Benchmark Values (TBVs) for Plants and Soil Fauna (continued)*

Analyte	Analtye Code	Species	TBV (mg/kg)	Endpoint Description	Reference	Comment
Nitrate, nitrite-nonspecific	NIT	NA	NA	NA	NA	NA
Nitrate	NO3	NA	NA	NA	NA	NA
Nitrite	NO2	NA	NA	NA	NA	NA
Nitrobenzene	NB	NA	NA	NA	NA	NA
Nitrobenzene	NB	Earthworms	40	Recommended benchmark value	Suter et al, 1995	
N-Nitrosodiphenylamine	NNDPA	NA	NA	NA	NA	NA
Octachlorodibenzodioxin	OCDD	NA	NA	NA	NA	NA
Octachlorodibenzofuran	OCDF	NA	NA	NA	NA	NA
PCB-1248	PCB248	Pigweed	40	LOEC for biomass and height for PCBs	Suter et al., 1993	See PCB1254
PCB-1248	PCB248	Earthworm	240	LC50 in soil for 14-d laboratory bioassay.	Rhett et al., 1988	See PCB1254
PCB-1254	PCB254	Pigweed	40	LOEC for biomass and height for PCBs	Suter et al., 1993	Only value
PCB-1254	PCB254	Earthworm	240	LC50 in soil for 14-d laboratory bioassay.	Rhett et al., 1988	Primary reference; seem more sensitive than crickets so
PCB-1260	PCB260	Pigweed	40	LOEC for biomass and height for PCBs	Suter et al., 1993	See PCB 1254
PCB-1260	PCB260	Earthworm	240	LC50 in soil for 14-d laboratory bioassay.	Rhett et al., 1988	See PCB 1254
2,3,4,7,8-Pentachlorodibenzofuran	234PCF	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	78PCDD	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	78PCDF	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	PETN	NA	NA	NA	NA	NA
Phenanthrene	PHANTR	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Phenanthrene	PHANTR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
Phenol	PHENOL	NA	NA	NA	NA	NA
Phenol	PHENOL	Earthworms	30	Recommended benchmark value	Suter et al, 1995	
Phosphate	PO4	NA	NA	NA	NA	NA
ppDDD	PPDDD	Earthworm	200	95% mortality	Jorgensen et al., 1991	
ppDDE	PPDDE	Earthworm	200	95% mortality	Jorgensen et al., 1991	
ppDDT	PPDDT	Earthworm	200	95% mortality	Jorgensen et al., 1991	
Pyrene	PYR	Lettuce	25	Use ANAPNE	Use ANAPNE	Use ANAPNE
Pyrene	PYR	Earthworm	173	Use FLRENE	Use FLRENE	Use FLRENE
RDX (Cyclonite)	RDX	NA	NA	NA	NA	NA
Selenium	SE	Wheat and buckwheat	1	Decreased growth rate	ICF, 1989	Only value
Selenium	SE	Earthworm	70	Recommended benchmark value	Suter et al, 1995	
Silver	AG	Plants	2	Recommended benchmark value	Suter et al., 1995	Only value
Sulfate	SO4	NA	NA	NA	NA	NA

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Table 7-28. Final Toxicity Benchmark Values (TBVs) for Plants and Soil Fauna (continued)

Analyte	Analtye Code	Species	TBV (mg/kg)	Endpoint Description	Reference	Comment
2,3,7,8-Tetrachlorodibenzo-p-dioxin	TCDD	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	TCDF	NA	NA	NA	NA	NA
Tetrachloroethylene	TCLEE	NA	NA	NA	NA	NA
Thallium	TL	Plants	1	Recommended benchmark value	Suter et al, 1995	
Thallium	TL	NA	NA	NA	NA	NA
Toluene	MEC6H5	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p dioxins	THCDD	NA	NA	NA	NA	NA
Total hexachlorodibenzofurans	THCDF	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxins	THPCDD	NA	NA	NA	NA	NA
Total heptachlorodibenzofurans	THPCDF	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxins	TPCDD	NA	NA	NA	NA	NA
Total pentachlorodibenzofurans	TPCDF	NA	NA	NA	NA	NA
Total petroleum hydrocarbons	TPHC	NA	NA	NA	NA	NA
Total phosphates	TPO4	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxins	TTCDD	NA	NA	NA	NA	NA
Total tetrachlorodibenzo furans	TTCDF	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	111TCE	NA	NA	NA	NA	NA
Trichloroethylene	TRCLE	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene	135TNB	NA	NA.	NA	NA	NA
2,4,6-Trinitrotoluene	246TNT	Plants	2.1	May inhibit growth. Estimated from 0.5 mg/L in nutrient solution, where 0-24% appears in leachate and rest in soil.	CRREL 1990	Only value
Vanadium	V	Plants	2	Recommended benchmark value	Suter et al., 1995	Only value
Xylenes	XYLEN	NA	NA	NA	NA	NA
m-Xylene	13DMB	NA	NA	NA	NA	NA
Zinc	ZN	Plants	50	Recommended benchmark value	Suter et al., 1995	
Zinc	ZN	Earthworms	200	Recommended benchmark value	Suter et al, 1995	

Note.-For acronym and abbreviation definitions, see the Acronym and Abbreviations list located behind the Table of Contents.

Table 7-29. Hazard Quotients/Hazard Indices Based on TEAD Background UBC Soil Concentrations and the Soil Ingestion Exposure Pathway

		TEAD BKG UBC	Passerines	American Kestrel	Great Horned Owl	Golden Eagle	Bald Eagle	Deer Mouse	Mule Deer	Jackrabbit	Kit Fox	Plant	Soil Fauna
Analyte Code	Analyte	(mg/kg)	HQs	HQs	HQs	HQs	HQs	HQs	HQs	HQs	HQs	HQs	HQs
AG	Silver	0.66	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	ND
AL	Aluminum	28083	ND	ND	ND	ND	ND	14.91	1.49	3.30	18.61	38.47	10.03
AS	Arsenic	11.70	0.60	0.03	0.02	0.03	0.03	0.08	0.01	0.03	0.14	1.17	0.20
BA	Barium	247.00	1.83	0.10	0.05	0.09	0.09	0.55	0.07	0.20	0.92	0.49	ND
BE	Beryllium	1.46	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	ND
CD	Cadmium	0.847	0.94	0.05	0.02	0.05	0.05	0.01	0.00	0.00	0.01	0.28	0.04
CO	Cobalt	6.94	0.01	0.00	0.00	0.00	0.00	0.77	0.10	0.27	1.53	0.35	ND
CR	Chromium	20.62	11.42	0.64	0.30	0.59	0.59	0.05	0.00	0.01	0.04	0.27	51.56
CU	Copper	24.72	0.32	0.02	0.01	0.02	0.02	0.14	0.01	0.03	0.11	0.25	0.30
FE	Iron	22731	41.96	2.37	1.08	2.17	2.17	30.85	4.12	11.39	51.26	ND	22.73
HG	Mercury	0.0572	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.06
MN	Manganese	698.33	1.23	0.07	0.03	0.06	0.06	0.28	0.04	0.10	0.46	1.40	ND
NI	Nickel	17.9	0.46	0.02	0.01	0.02	0.02	0.02	0.00	0.01	0.03	0.07	0.09
PB	Lead	18.23	0.91	0.01	0.02	0.04	0.04	0.12	0.02	0.04	0.20	0.04	0.03
SB	Antimony	15	ND	ND	ND	ND	ND	0.66	0.09	0.25	1.11	3.00	ND
SE	Selenium	0.449	0.50	0.03	0.01	0.02	0.02	0.08	0.01	0.02	0.10	0.45	0.01
TL	Thallium	11.7	33.70	1.90	0.87	2.18	2.18	3.45	0.41	1.15	5.17	11.70	ND
V	Vanadium	28.39	ND	ND	ND	ND	ND	0.47	0.03	0.10	0.46	14.19	ND
ZN	Zinc	102.84	2.74	0.15	0.07	0.14	0.14	0.13	0.01	0.03	0.13	2.06	0.51
HI_TOTAL$_{TEAD}$			**96.7**	**5.4**	**2.5**	**5.4**	**5.4**	**52.6**	**6.4**	**16.9**	**80.3**	**74.9**	**85.5**

Table 7-30. Hazard Quotients/Hazard Indices Based on RSA UBC Soil Concentrations and the Soil Ingestion Exposure Pathway

		RSA UBC	Passerines	American Kestrel	Great Horned Owl	Golden Eagle	Bald Eagle	Deer Mouse	Mule Deer	Jackrabbit	Kit Fox	Plant	Soil Fauna
Analyte Code	Analyte	(mg/kg)	HQs	HQs	HQs	HQs	HQs	HQs	HQs	HQs	HQs	HQs	HQs
AG	Silver	0.803	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	ND
AL	Aluminum	17300	ND	ND	ND	ND	ND	9.18	0.92	2.03	11.46	23.70	6.18
AS	Arsenic	8.86	0.46	0.03	0.01	0.02	0.02	0.06	0.01	0.02	0.10	0.89	0.15
BA	Barium	134	0.99	0.06	0.03	0.05	0.05	0.30	0.04	0.11	0.50	0.27	ND
BE	Beryllium	0.823	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	ND
CA	Calcium	35548	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CD	Cadmium	1.2	1.33	0.07	0.03	0.06	0.06	0.01	0.00	0.00	0.02	0.40	0.06
CO	Cobalt	7.99	0.01	0.00	0.00	0.00	0.00	0.88	0.11	0.31	1.77	0.40	ND
CR	Chromium	22.6	12.52	0.71	0.32	0.65	0.65	0.05	0.00	0.01	0.04	0.30	56.50
CU	Copper	17.24	0.22	0.01	0.01	0.01	0.01	0.10	0.01	0.02	0.08	0.17	0.21
CYN	Cyanide	0.25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	Iron	17400	32.12	1.81	0.83	1.66	1.66	23.62	3.15	8.72	39.24	ND	17.40
HG	Mercury	0.0697	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.07
K	Potassium	3259	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MG	Magnesium	6311	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	Manganese	499	0.88	0.05	0.02	0.05	0.05	0.20	0.03	0.07	0.33	1.00	ND
NA	Sodium	282	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	Nickel	14.8	0.38	0.02	0.01	0.02	0.02	0.01	0.00	0.00	0.02	0.06	0.07
PB	Lead	73.3	3.64	0.04	0.09	0.15	0.15	0.49	0.06	0.18	0.81	0.15	0.12
SB	Antimony	1	ND	ND	ND	ND	ND	0.04	0.01	0.02	0.07	0.20	ND
SE	Selenium	0.499	0.55	0.03	0.01	0.03	0.03	0.09	0.01	0.02	0.11	0.50	0.01
TL	Thallium	34.3	98.78	5.57	2.55	6.38	6.38	10.12	1.21	3.36	15.16	34.30	ND
V	Vanadium	24.3	ND	ND	ND	ND	ND	0.41	0.03	0.09	0.40	12.15	ND
ZN	Zinc	127	3.39	0.19	0.09	0.17	0.17	0.17	0.01	0.04	0.17	2.54	0.64
HI_TOTAL$_{RSA}$			**155.3**	**8.6**	**4.0**	**9.3**	**9.3**	**45.7**	**5.6**	**15.0**	**70.3**	**77.7**	**81.4**

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Table 7-31. Final Hazard Indices for Soil & Surface Water Exposure Pathways for Passerine Birds (TEAD Historic Data)

		SWMU[a]													
Group	RSA[b]	01	1b	1c	03	04	06	07	08	10	11	12	13	14	15
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.023	0.193	ND	ND	2.556	ND	0.024	ND	0.028	ND	0.054	ND	ND	5.578	0.109
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.436	ND	ND	ND	ND	0.147	1.435	1.309	0.478	ND	0.664	0.620	ND	1.074	1.416
A_D	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.078	0.004	ND	ND	0.052
BA	0.600	5.346	ND	ND	ND	0.365	1.309	1.303	1.438	ND	0.826	ND	ND	2.664	1.523
BE	0.005	0.006	ND	ND	ND	0.002	ND	0.004	ND	ND	ND	ND	ND	ND	ND
BZALC	0.011	ND	ND	ND	ND	0.021	ND	ND	ND	ND	ND	ND	ND	0.568	ND
CD	0.662	14.365	5.587	ND	0.245	7.647	1.642	0.953	ND	ND	14.225	ND	ND	45.643	4.817
CLDN	0.003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.014	ND	ND	ND
CO	0.005	0.004	ND	ND	0.001	0.005	0.004	0.006	0.006	ND	0.004	ND	ND	ND	0.007
CR_CRHEX	6.819	10.495	ND	ND	12.755	43.745	9.085	10.909	11.428	ND	23.545	ND	6.344	81.154	131.418
CU	0.225	68.811	ND	ND	0.234	0.298	0.593	0.213	2.620	ND	67.696	ND	ND	5.321	4.401
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.041	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.407
DIOXIN_FURAN	8.202	ND	0.022	0.011	ND	ND	ND	ND	ND	1.724	0.075	ND	ND	ND	3.219
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.246	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.848	ND	ND	ND
ENDOSULFAN	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.560
FE	19.604	42.703	ND	ND	ND	17.976	29.153	36.126	38.108	ND	98.168	ND	ND	ND	44.328
HG	0.010	0.025	ND	ND	0.020	0.005	0.022	ND	0.009	ND	0.153	ND	0.012	0.535	0.048
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.422	ND	ND	ND	ND	0.209	ND	0.936	ND	ND	1.342	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.248	0.352	ND	ND	ND	0.291	0.208	0.308	0.407	ND	1.075	ND	ND	0.769	0.243
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	1.303	207.923	1.416	ND	0.236	6.923	47.309	2.184	248.079	ND	166.832	3.509	0.572	11.689	9.107
PCB_S	0.351	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.379
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.229	ND	ND	ND	0.023	0.128	ND	ND	ND	ND	1.471	ND	0.391	1.572	0.082
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.248	ND	ND	ND	0.106	ND	ND	ND	ND	ND	0.541	ND	ND	2.692	0.396
TL	49.233	24.344	ND	ND	ND	21.445	ND	ND	ND	ND	ND	ND	ND	31.617	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.875	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	1.277	268.631	ND	ND	0.711	5.232	4.828	6.961	2.200	ND	19.997	ND	ND	33.492	9.179
HI[d]_TOTAL	**90.2**	**643.2**	**7.0**	**0.01**	**16.9**	**104.4**	**95.6**	**61.2**	**304.8**	**1.7**	**397.6**	**5.0**	**7.3**	**224.4**	**211.7**

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Table 7-31. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for Passerine Birds (TEAD Historic Data) (continued)*

Group	RSA	SWMU 19	20	21	22	23	25	26	27	28	29	30	31	32	34
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.023	ND	ND	0.156	0.005	0.027	0.248	0.041	ND	ND	ND	ND	ND	ND	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.436	ND	0.347	0.280	0.152	0.999	0.802	0.406	0.813	0.981	0.841	0.485	ND	0.131	0.109
A_D	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.003
BA	0.600	ND	3.726	12.397	ND	0.801	0.981	ND	ND	ND	ND	1.423	ND	ND	ND
BE	0.005	ND	ND	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.011	ND	ND	ND	ND	0.029	ND	ND	ND	ND	ND	ND	ND	0.008	ND
CD	0.662	2.597	9.472	132.790	ND	6.107	2.409	4.245	14.521	7.186	0.644	7.343	ND	0.636	0.385
CLDN	0.003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CO	0.005	ND	ND	0.002	0.001	0.004	0.003	ND	ND	ND	ND	0.005	ND	ND	ND
CR_CRHEX	6.819	8.445	16.763	297.492	1.664	43.372	16.372	33.468	136.012	12.714	22.966	57.907	ND	3.106	1.703
CU	0.225	5.334	6.488	44.114	0.038	0.629	1.058	3.610	0.529	0.263	ND	0.425	ND	0.055	0.083
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.041	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.541	ND	ND	ND	29.453
DIOXIN_FURAN	8.202	ND	ND	0.051	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.246	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.263
ENDOSULFAN	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	19.604	51.158	22.103	36.749	5.109	30.286	90.909	ND	ND	ND	ND	31.526	ND	ND	ND
HG	0.010	ND	0.009	0.006	ND	0.019	0.168	0.009	1.483	ND	ND	0.015	ND	ND	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.004
LIN	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
MN	0.422	ND	ND	0.518	ND	ND	0.613	ND	ND	ND	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.248	0.271	0.517	0.788	0.067	0.223	0.192	0.223	0.352	ND	ND	0.308	ND	ND	0.057
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	1.303	6.781	71.872	374.028	0.292	7.361	39.228	13.709	22.275	4.592	2.686	8.285	1.776	0.522	1.563
PCB_S	0.351	ND	ND	ND	ND	14.397	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.229	0.257	0.231	0.078	ND	0.078	ND	ND	ND	0.138	ND	ND	0.069	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.248	ND	ND	0.811	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.053
TL	49.233	ND	22.924	43.921	ND	ND	ND	12.628	39.382	39.738	ND	ND	ND	ND	5.976
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.775	3.008	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	1.277	97.286	19.262	103.336	0.732	10.703	4.074	35.711	11.323	ND	5.024	5.661	ND	ND	2.071
HI_TOTAL	**90.2**	**172.1**	**173.7**	**1047.5**	**8.1**	**115.0**	**157.1**	**104.1**	**226.7**	**73.4**	**37.7**	**113.4**	**1.8**	**4.5**	**49.7**

Table 7-31. Final Hazard Indices for Soil & Surface Water Exposure Pathways for Passerine Birds (TEAD Historic Data) (continued)

		SWMU								
Group	**RSA**	**35**	**36**	**37**	**38**	**40**	**42**	**45**	**46**	**47**
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.023	ND	0.027	ND	ND	0.023	0.396	0.059	ND	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.436	3.164	0.512	ND	ND	0.866	1.123	2.547	0.109	ND
A_D	0.002	ND	ND	ND	ND	ND	ND	3.126	ND	ND
BA	0.600	ND	1.414	ND	ND	1.610	52.405	0.001	ND	ND
BE	0.005	ND	ND	ND	ND	ND	0.004	ND	ND	ND
BZALC	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND
CD	0.662	0.669	ND	0.761	0.569	1.202	11.683	4.695	0.863	ND
CLDN	0.003	0.053	ND	ND	ND	ND	ND	1.120	ND	ND
CO	0.005	0.007	0.003	ND	ND	0.003	0.005	0.004	ND	ND
CR_CRHEX	6.819	ND	8.322	ND	ND	7.829	50.009	27.244	6.640	ND
CU	0.225	0.247	3.331	ND	0.171	0.461	40.324	1.127	0.144	ND
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.041	2.758	ND	ND	ND	ND	14.094	47.286	ND	ND
DIOXIN_FURAN	8.202	ND	ND	8.450	ND	ND	18.829	0.312	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.246	36.909	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	19.604	35.085	32.780	ND	ND	24.168	33.278	0.000	10.668	ND
HG	0.010	ND	ND	ND	0.008	0.008	0.019	0.029	0.014	0.032
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.004	0.269	ND	ND	ND	ND	ND	ND	ND	ND
LIN	0.001	0.290	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.422	ND	ND	ND	ND	ND	0.492	0.000	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.248	ND	ND	ND	ND	0.193	0.989	0.377	0.107	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	1.303	3.191	19.584	1.642	0.883	5.921	549.935	16.395	4.257	12.826
PCB_S	0.351	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.229	ND	ND	0.021	0.006	ND	0.041	1.405	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.248	ND	ND	ND	ND	ND	ND	ND	ND	ND
TL	49.233	ND	ND	ND	15.327	ND	69.105	47.543	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	10.249	184.877
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	1.277	2.886	6.190	13.530	ND	2.231	32.712	9.647	1.592	ND
HI_TOTAL	**90.2**	**85.5**	**72.2**	**24.4**	**17.0**	**44.5**	**875.4**	**162.9**	**34.6**	**197.7**

[a]Solid Waste Management Unit [c]No Data or Pathway Incomplete
[b]Reference Study Area [d]Hazard Index

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Table 7-32. Final Hazard Indices for All Exposure Pathways for Passerine Birds (TEAD Current Data)

		SWMU[a]									
GROUP	RSA[b]	1b	1c	10	11	12	15	21	37	42	45
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.079	0.085	0.086	0.080	0.080	0.076	0.077	0.042	0.081	0.077	0.077
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.560	0.274	0.454	0.508	0.779	0.968	3.807	0.243	0.390	1.537	2.045
A_D	0.002	0.001	0.001	0.001	0.005	0.004	0.022	0.000	0.028	0.001	0.203
BA	1.204	2.149	1.855	0.808	1.809	1.495	2.401	2.327	1.033	7.703	1.546
BE	0.005	0.005	0.005	0.002	0.002	0.002	0.002	0.001	0.002	0.004	0.006
BZALC	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.005	0.011	0.011	0.718
CD	3.258	17.650	6.017	2.426	4.914	2.286	18.067	22.508	4.424	12.561	10.641
CLDN	0.003	0.003	0.003	0.003	0.003	0.025	0.003	0.001	0.003	0.003	0.179
CO	0.006	0.004	0.005	0.002	0.001	0.001	0.013	0.002	0.003	0.008	0.005
CR_CRHEX	8.859	9.482	9.632	4.982	14.891	7.336	28.302	5.309	6.117	9.247	37.453
CU	1.182	1.504	1.298	1.446	4.441	1.169	60.311	4.699	1.520	3.038	2.882
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	1.294	1.277	2.040	1.480	2.901	0.888	4.690	1.332	1.768	2.199	2.590
DIOXIN_FURAN	18.819	54.669	54.842	63.395	62.961	55.106	58.299	25.322	61.915	56.527	10.767
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.246	0.308	0.239	0.239	0.239	0.865	0.239	0.100	0.239	0.239	5.003
ENDOSULFAN	0.004	0.001	0.001	0.001	0.001	0.001	0.004	0.000	0.010	0.001	0.008
FE	21.808	24.975	28.858	13.635	89.376	12.167	68.858	8.839	16.485	13.408	33.538
HG	0.043	0.039	0.037	0.050	0.060	0.034	0.321	0.032	0.037	0.067	0.083
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.004	0.004	0.004	0.004	0.004	0.004	0.019	0.002	0.004	0.004	0.042
LIN	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.012
MN	0.649	0.769	0.780	0.358	0.686	0.374	0.629	0.233	0.360	0.463	0.822
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.413	0.298	0.400	0.195	0.951	0.229	0.392	0.207	0.335	0.648	0.512
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	4.868	3.633	2.177	0.823	192.491	9.408	21.777	40.369	2.236	68.496	40.627
PCB_S	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.146	0.351	0.351	3.517
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.229	0.142	0.142	0.142	0.145	0.142	0.142	0.059	0.142	0.142	6.661
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	3.598	2.891	2.903	3.077	3.086	3.137	4.757	2.209	3.715	4.044	2.959
TL	49.233	49.233	49.233	49.233	49.233	49.233	49.233	20.514	49.233	49.233	49.233
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	8.580	11.808	7.699	8.345	76.194	11.114	43.944	13.752	7.865	9.241	18.266
HI[d] TOTAL	125.3	181.6	169.1	151.6	505.6	156.4	366.7	148.3	158.3	239.3	230.4

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-33. Final Hazard Indices for All Exposure Pathways for Passerine Birds (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	ND	ND	ND
24D	ND	ND	ND
AG	0.079	0.077	0.080
AL	ND	ND	ND
AS	0.560	1.624	1.242
A_D	0.002	0.077	0.009
BA	1.204	5.201	2.255
BE	0.005	0.005	0.003
BZALC	0.011	0.718	0.011
CD	3.258	10.849	13.978
CLDN	0.003	0.077	0.007
CO	0.006	0.006	0.005
CR_CRHEX	8.859	19.575	12.828
CU	1.182	2.922	12.721
DCB	ND	ND	ND
DDT_R	1.410	2.412	2.431
DIOXIN_FURAN	18.819	9.426	66.760
DN_TOL	ND	ND	ND
E_I	0.246	2.443	0.360
ENDOSULFAN	0.004	0.004	0.004
FE	21.808	22.008	37.311
HG	0.043	0.068	0.092
HMX	ND	ND	ND
H_HE	0.004	0.042	0.007
LIN	0.001	0.012	0.001
MN	0.649	0.610	0.572
NB	ND	ND	ND
NI	0.413	0.578	0.479
NNDPA	ND	ND	ND
PAH	ND	ND	ND
PB	4.868	47.279	43.999
PCB_S	0.351	3.517	0.351
PHENOL	ND	ND	ND
PHTLAT	0.229	6.661	0.145
RDX	ND	ND	ND
SB	ND	ND	ND
SE	3.598	3.020	3.571
TL	49.233	49.233	49.233
TPHC	ND	ND	ND
V	ND	ND	ND
ZN	8.580	13.851	25.336
HI[d] TOTAL	125.4	202.3	273.8

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-34. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the American Kestrel (TEAD Historic Data)

Group	RSA[b]	SWMU[a] 01	1b	1c	03	04	06	07	08	10	11	12	13	14	15	19
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.001	0.008	ND	ND	0.000	ND	0.000	ND	0.000	ND	0.000	ND	ND	0.004	0.001	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.025	ND	ND	ND	ND	0.000	0.006	0.013	0.000	ND	0.001	0.002	ND	0.001	0.017	ND
A_D	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	0.000	ND	ND	0.001	ND
BA	0.034	0.223	ND	ND	ND	0.000	0.006	0.013	0.000	ND	0.001	ND	ND	0.002	0.018	ND
BE	0.000	0.000	ND	ND	ND	0.000	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.001	ND	ND	ND	ND	0.000	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND
CD	0.037	0.599	0.001	ND	0.000	0.001	0.007	0.009	ND	ND	0.010	ND	ND	0.032	0.057	0.001
CLDN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND	ND	ND
CO	0.000	0.000	ND	ND	0.000	0.000	0.000	0.000	0.000	ND	0.000	ND	ND	ND	0.000	ND
CR_CRHEX	0.386	0.437	ND	ND	0.001	0.003	0.040	0.106	0.004	ND	0.033	ND	0.023	0.057	1.565	0.004
CU	0.013	2.868	ND	ND	0.000	0.000	0.003	0.002	0.001	ND	0.050	ND	ND	0.004	0.052	0.003
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005	ND
DIOXIN_FURA	0.464	ND	0.000	0.000	ND	ND	ND	ND	ND	0.001	0.000	ND	ND	ND	0.038	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.003	ND	ND	ND	ND
ENDOSULFAN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.007	ND
FE	1.109	1.780	ND	ND	ND	0.001	0.129	0.352	0.012	ND	0.083	ND	ND	ND	0.528	0.026
HG	0.001	0.001	ND	ND	0.000	0.000	0.000	ND	0.000	ND	0.000	ND	0.000	0.000	0.001	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.024	ND	ND	ND	ND	0.000	ND	0.009	ND	ND	0.001	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.014	0.015	ND	ND	ND	0.000	0.001	0.003	0.000	ND	0.002	ND	ND	0.001	0.003	0.000
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.015	1.733	0.000	ND	0.000	0.000	0.042	0.004	0.015	ND	0.024	0.003	0.000	0.002	0.022	0.001
PCB_S	0.020	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.013	ND	ND	ND	0.000	0.000	ND	ND	ND	ND	0.004	ND	0.001	0.001	0.001	0.000
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.014	ND	ND	ND	0.000	ND	ND	ND	ND	ND	0.012	ND	ND	0.002	0.005	ND
TL	2.785	1.015	ND	ND	ND	0.002	ND	ND	ND	ND	ND	ND	ND	0.022	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.072	11.198	ND	ND	0.000	0.000	0.021	0.068	0.001	ND	0.033	ND	ND	0.024	0.109	0.049
HI[d]_TOTAL	**5.0**	**19.9**	**0.00**	**0.00**	**0.00**	**0.0**	**0.3**	**0.6**	**0.0**	**0.00**	**0.3**	**0.01**	**0.02**	**0.2**	**2.4**	**0.1**

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Table 7-34. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the American Kestrel (continued) (TEAD Historic Data) (continued)*

		SWMU														
Group	**RSA**	**20**	**21**	**22**	**23**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**34**	**35**	**36**
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.001	ND	0.000	0.000	0.000	0.000	0.000	ND	ND	ND	ND	ND	ND	ND	ND	0.000
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.025	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.003	0.002	ND	0.000	0.000	0.012	0.000
A_D	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND
BA	0.034	0.004	0.001	ND	0.001	0.001	ND	ND	ND	ND	0.007	ND	ND	ND	ND	0.001
BE	0.000	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.001	ND	ND	ND	0.000	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND	ND
CD	0.037	0.010	0.009	ND	0.001	0.001	0.030	0.002	0.003	0.002	0.037	ND	0.000	0.000	0.003	ND
CLDN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
CO	0.000	ND	0.000	0.000	0.000	0.000	ND	ND	ND	ND	0.000	ND	ND	ND	0.000	0.000
CR_CRHEX	0.386	0.017	0.021	0.000	0.007	0.010	0.239	0.021	0.005	0.082	0.290	ND	0.000	0.000	ND	0.003
CU	0.013	0.007	0.003	0.000	0.000	0.001	0.026	0.000	0.000	ND	0.002	ND	0.000	0.000	0.001	0.001
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.002	ND	ND	ND	ND	ND	ND	ND	ND	0.009	ND	ND	ND	0.002	0.011	ND
DIOXIN_FURA	0.464	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	0.145	ND
ENDOSULFAN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	1.109	0.023	0.003	0.000	0.006	0.056	ND	ND	ND	ND	0.158	ND	ND	ND	0.138	0.012
HG	0.001	0.000	0.000	ND	0.000	0.000	0.000	0.000	ND	ND	0.000	ND	ND	ND	ND	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	0.001	ND
LIN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	0.001	ND
MN	0.024	ND	0.000	ND	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.014	0.001	0.000	0.000	0.000	0.000	0.002	0.000	ND	ND	0.002	ND	ND	0.000	ND	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.015	0.015	0.005	0.000	0.000	0.005	0.020	0.001	0.000	0.002	0.008	0.000	0.000	0.000	0.003	0.001
PCB_S	0.020	ND	ND	ND	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.013	0.000	0.000	ND	0.000	ND	ND	ND	0.000	ND	ND	0.000	ND	ND	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.014	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND
TL	2.785	0.023	0.003	ND	ND	ND	0.090	0.006	0.016	ND	ND	ND	ND	0.000	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	0.003	0.011	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.072	0.020	0.007	0.000	0.002	0.003	0.255	0.002	ND	0.018	0.028	ND	ND	0.000	0.011	0.002
HI_TOTAL	**5.0**	**0.1**	**0.1**	**0.00**	**0.02**	**0.1**	**0.7**	**0.03**	**0.03**	**0.1**	**0.5**	**0.00**	**0.00**	**0.00**	**0.3**	**0.02**

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Table 7-34. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the American Kestrel (TEAD Historic Data) (continued)*

		SWMU						
Group	RSA	37	38	40	42	45	46	47
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.001	ND	ND	0.000	0.003	0.000	ND	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.025	ND	ND	0.006	0.010	0.003	0.000	ND
A_D	0.000	ND	ND	ND	ND	0.004	ND	ND
BA	0.034	ND	ND	0.012	0.449	0.001	ND	ND
BE	0.000	ND	ND	ND	0.000	ND	ND	ND
BZALC	0.001	ND	ND	ND	ND	ND	ND	ND
CD	0.037	0.000	0.000	0.009	0.100	0.006	0.000	ND
CLDN	0.000	ND	ND	ND	ND	0.001	ND	ND
CO	0.000	ND	ND	0.000	0.000	0.000	ND	ND
CR_CRHEX	0.386	ND	ND	0.056	0.429	0.032	0.000	ND
CU	0.013	ND	0.000	0.003	0.346	0.001	0.000	ND
DCB	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.002	ND	ND	ND	0.121	0.056	ND	ND
DIOXIN_FURA	0.464	0.001	ND	ND	0.161	0.000	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.014	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	0.000	ND	ND	ND	ND	ND	ND	ND
FE	1.109	ND	ND	0.173	0.285	0.000	0.001	ND
HG	0.001	ND	0.000	0.000	0.000	0.000	0.000	0.000
HMX	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	ND	ND	ND	ND	ND	ND	ND
LIN	0.000	ND	ND	ND	ND	ND	ND	ND
MN	0.024	ND	ND	ND	0.004	0.000	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.014	ND	ND	0.001	0.008	0.000	0.000	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.015	0.000	0.000	0.008	0.943	0.004	0.000	0.001
PCB_S	0.020	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.013	0.000	0.000	ND	0.000	0.003	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.014	ND	ND	ND	ND	ND	ND	ND
TL	2.785	ND	0.001	ND	0.593	0.057	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	0.001	0.040
V	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.072	0.002	ND	0.016	0.280	0.011	0.000	ND
HI_TOTAL	**5.0**	**0.00**	**0.00**	**0.3**	**3.7**	**0.2**	**0.00**	**0.04**

[a]Solid Waste Management Unit [c]No Data or Pathway Incomplete
[b]Reference Study Area [d]Hazard Index

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Table 7-35. Final Hazard Indices for All Exposure Pathways for the American Kestrel (TEAD Current Data)

		SWMU[a]									
GROUP	**RSA[b]**	**1b**	**1c**	**10**	**11**	**12**	**15**	**21**	**37**	**42**	**45**
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.015	0.000	0.001	0.000	0.000	0.001	0.003	0.000	0.000	0.002	0.001
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.049	0.001	0.003	0.002	0.002	0.024	0.064	0.000	0.000	0.024	0.015
A_D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BA	0.126	0.006	0.021	0.001	0.004	0.016	0.056	0.001	0.000	0.074	0.007
BE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BZALC	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
CD	0.494	0.060	0.071	0.007	0.012	0.089	0.277	0.005	0.003	0.255	0.087
CLDN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CR_CRHEX	0.844	0.021	0.061	0.006	0.031	0.066	0.370	0.001	0.001	0.104	0.081
CU	0.224	0.022	0.025	0.006	0.014	0.061	1.305	0.002	0.001	0.081	0.047
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.068	0.001	0.007	0.002	0.002	0.013	0.185	0.001	0.001	0.054	0.040
DIOXIN_FURAN	3.575	0.040	1.390	0.195	0.263	1.148	3.616	0.010	0.051	2.526	0.032
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.014	0.000	0.001	0.000	0.000	0.003	0.003	0.000	0.000	0.002	0.006
ENDOSULFAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FE	1.598	0.023	0.156	0.010	0.080	0.076	0.856	0.001	0.003	0.145	0.072
HG	0.007	0.001	0.001	0.000	0.000	0.001	0.008	0.000	0.000	0.002	0.001
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MN	0.045	0.002	0.004	0.000	0.001	0.004	0.009	0.000	0.000	0.005	0.003
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.036	0.001	0.002	0.000	0.002	0.003	0.006	0.000	0.000	0.008	0.004
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.227	0.001	0.007	0.000	0.105	0.026	0.164	0.002	0.000	0.378	0.035
PCB_S	0.020	0.000	0.002	0.000	0.000	0.001	0.004	0.000	0.000	0.003	0.004
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.013	0.000	0.001	0.000	0.003	0.001	0.002	0.000	0.000	0.001	0.009
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.719	0.012	0.048	0.008	0.021	0.079	0.219	0.002	0.003	0.130	0.038
TL	2.785	0.006	0.235	0.023	0.035	0.176	0.586	0.001	0.008	0.422	0.059
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	2.006	0.113	0.125	0.033	0.254	0.485	1.655	0.005	0.005	0.310	0.296
HI[d] TOTAL	**12.9**	**0.3**	**2.2**	**0.3**	**0.8**	**2.3**	**9.4**	**0.0**	**0.1**	**4.5**	**0.8**

[a]Solid waste management unit.

[b]Reference study area.

[c]No data or pathway incomplete.

[d]Hazard index.

Table 7-36. Final Hazard Indices for All Exposure Pathways for the American Kestrel (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	ND	ND	ND
24D	ND	ND	ND
AG	0.015	0.003	0.006
AL	ND	ND	ND
AS	0.049	0.027	0.050
A_D	0.000	0.001	0.000
BA	0.126	0.032	0.092
BE	0.000	0.000	0.000
BZALC	0.001	0.007	0.000
CD	0.494	0.166	0.555
CLDN	0.000	0.001	0.000
CO	0.000	0.000	0.000
CR_CRHEX	0.844	0.243	0.351
CU	0.224	0.090	0.522
DCB	ND	ND	ND
DDT_R	0.104	0.056	0.156
DIOXIN_FURAN	3.575	0.117	7.464
DN_TOL	ND	ND	ND
E_I	0.014	0.024	0.008
ENDOSULFAN	0.000	0.000	0.000
FE	1.598	0.266	0.892
HG	0.007	0.002	0.005
HMX	ND	ND	ND
H_HE	0.000	0.000	0.000
LIN	0.000	0.000	0.000
MN	0.045	0.007	0.016
NB	ND	ND	ND
NI	0.036	0.009	0.013
NNDPA	ND	ND	ND
PAH	ND	ND	ND
PB	0.227	0.268	0.624
PCB_S	0.020	0.034	0.008
PHENOL	ND	ND	ND
PHTLAT	0.013	0.066	0.006
RDX	ND	ND	ND
SB	ND	ND	ND
SE	0.719	0.063	0.289
TL	2.785	0.480	1.070
TPHC	ND	ND	ND
V	ND	ND	ND
ZN	2.006	0.426	1.827
HI[d] TOTAL	**12.9**	**2.4**	**14.0**

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-37. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Great Horned Owl (TEAD Historic Data)

		SWMU[a]														
Group	RSA[b]	01	1b	1c	03	04	06	07	08	10	11	12	13	14	15	19
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.000	0.000	ND	ND	0.000	ND	0.000	ND	0.000	ND	0.000	ND	ND	0.000	0.000	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.009	ND	ND	ND	ND	0.000	0.000	0.000	0.000	ND	0.000	0.000	ND	0.000	0.000	ND
A_D	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	0.000	ND	ND	0.000	ND
BA	0.012	0.006	ND	ND	ND	0.000	0.000	0.000	0.000	ND	0.000	ND	ND	0.000	0.000	ND
BE	0.000	0.000	ND	ND	ND	0.000	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.000	ND	ND	ND	ND	0.000	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND
CD	0.013	0.016	0.000	ND	0.000	0.000	0.000	0.000	ND	ND	0.000	ND	ND	0.001	0.002	0.000
CLDN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND	ND	ND
CO	0.000	0.000	ND	ND	0.000	0.000	0.000	0.000	0.000	ND	0.000	ND	ND	ND	0.000	ND
CR_CRHEX	0.137	0.012	ND	ND	0.000	0.000	0.001	0.003	0.000	ND	0.002	ND	0.001	0.002	0.041	0.000
CU	0.005	0.076	ND	ND	0.000	0.000	0.000	0.000	0.000	ND	0.001	ND	ND	0.000	0.001	0.000
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
DIOXIN_FURAN	0.165	ND	0.000	0.000	ND	ND	ND	ND	ND	0.000	0.000	ND	ND	ND	0.001	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND	ND	ND
ENDOSULFAN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
FE	0.395	0.047	ND	ND	ND	0.000	0.003	0.009	0.000	ND	0.003	ND	ND	ND	0.014	0.001
HG	0.000	0.000	ND	ND	0.000	0.000	0.000	ND	0.000	ND	0.000	ND	0.000	0.000	0.000	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.009	ND	ND	ND	ND	0.000	ND	0.000	ND	ND	0.000	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.005	0.000	ND	ND	ND	0.000	0.000	0.000	0.000	ND	0.000	ND	ND	0.000	0.000	0.000
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.026	0.229	0.000	ND	0.000	0.000	0.006	0.001	0.002	ND	0.003	0.000	0.000	0.000	0.003	0.000
PCB_S	0.007	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.005	ND	ND	ND	0.000	0.000	ND	ND	ND	ND	0.000	ND	0.000	0.000	0.000	0.000
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.005	ND	ND	ND	0.000	ND	ND	ND	ND	ND	0.001	ND	ND	0.000	0.000	ND
TL	0.993	0.027	ND	ND	ND	0.000	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.026	0.296	ND	ND	0.000	0.000	0.001	0.002	0.000	ND	0.002	ND	ND	0.001	0.003	0.001
HI[d]_TOTAL	**1.8**	**0.7**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.02**	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.1**	**0.00**

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Table 7-37. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Great Horned Owl (TEAD Historic Data) (continued)*

Group	RSA	SWMU 20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.000	ND	0.000	0.000	0.000	0.000	0.000	ND	ND	ND	ND	ND	ND	ND	ND	0.000
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	ND	0.000	0.000	0.000	0.000
A_D	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND
BA	0.012	0.000	0.000	ND	0.000	0.000	ND	ND	ND	ND	0.000	ND	ND	ND	ND	0.000
BE	0.000	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.000	ND	ND	ND	0.000	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND	ND
CD	0.013	0.000	0.000	ND	0.000	0.000	0.001	0.000	0.000	0.000	0.001	ND	0.000	0.000	0.000	ND
CLDN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
CO	0.000	ND	0.000	0.000	0.000	0.000	ND	ND	ND	ND	0.000	ND	ND	ND	0.000	0.000
CR_CRHEX	0.137	0.000	0.001	0.000	0.000	0.000	0.006	0.001	0.000	0.002	0.008	ND	0.000	0.000	ND	0.000
CU	0.005	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	ND	0.000	ND	0.000	0.000	0.000	0.000
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.001	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND	ND	0.000	0.000	ND
DIOXIN_FURAN	0.165	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	0.004	ND
ENDOSULFAN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	0.395	0.001	0.000	0.000	0.000	0.001	ND	ND	ND	ND	0.004	ND	ND	ND	0.004	0.000
HG	0.000	0.000	0.000	ND	0.000	0.000	0.000	0.000	ND	ND	0.000	ND	ND	ND	ND	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	0.000	ND
LIN	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	0.000	ND
MN	0.009	ND	0.000	ND	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	ND	ND	0.000	ND	ND	0.000	ND	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.026	0.002	0.001	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
PCB_S	0.007	ND	ND	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.005	0.000	0.000	ND	0.000	ND	ND	ND	0.000	ND	ND	0.000	ND	ND	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.005	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND
TL	0.993	0.001	0.000	ND	ND	ND	0.002	0.000	0.000	ND	ND	ND	ND	0.000	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	0.000	0.000	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.026	0.001	0.000	0.000	0.000	0.000	0.007	0.000	ND	0.000	0.001	ND	ND	0.000	0.000	0.000
HI_TOTAL	1.8	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00

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Table 7-37. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Great Horned Owl (TEAD Historic Data) (continued)

		SWMU						
Group	RSA	37	38	40	42	45	46	47
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.000	ND	ND	0.000	0.000	0.000	ND	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.009	ND	ND	0.000	0.000	0.000	0.000	ND
A_D	0.000	ND	ND	ND	ND	0.000	ND	ND
BA	0.012	ND	ND	0.000	0.012	0.000	ND	ND
BE	0.000	ND	ND	ND	0.000	ND	ND	ND
BZALC	0.000	ND	ND	ND	ND	ND	ND	ND
CD	0.013	0.000	0.000	0.000	0.003	0.000	0.000	ND
CLDN	0.000	ND	ND	ND	ND	0.000	ND	ND
CO	0.000	ND	ND	0.000	0.000	0.000	ND	ND
CR_CRHEX	0.137	ND	ND	0.001	0.011	0.001	0.000	ND
CU	0.005	ND	0.000	0.000	0.009	0.000	0.000	ND
DCB	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.001	ND	ND	ND	0.003	0.001	ND	ND
DIOXIN_FURAN	0.165	0.000	ND	ND	0.004	0.000	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.005	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	0.000	ND	ND	ND	ND	ND	ND	ND
FE	0.395	ND	ND	0.005	0.008	0.000	0.000	ND
HG	0.000	ND	0.000	0.000	0.000	0.000	0.000	0.000
HMX	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	ND	ND	ND	ND	ND	ND	ND
LIN	0.000	ND	ND	ND	ND	ND	ND	ND
MN	0.009	ND	ND	ND	0.000	0.000	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.005	ND	ND	0.000	0.000	0.000	0.000	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.026	0.000	0.000	0.001	0.125	0.001	0.000	0.000
PCB_S	0.007	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.005	0.000	0.000	ND	0.000	0.000	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.005	ND	ND	ND	ND	ND	ND	ND
TL	0.993	ND	0.000	ND	0.016	0.001	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	0.000	0.001
V	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.026	0.000	ND	0.000	0.007	0.000	0.000	ND
HI_TOTAL	**1.8**	**0.00**	**0.00**	**0.01**	**0.2**	**0.0**	**0.00**	**0.00**

[a]Solid Waste Management Unit [c]No Data or Pathway Incomplete
[b]Reference Study Area [d]Hazard Index

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Table 7-38. Final Hazard Indices for All Exposure Pathways for the Great Horned Owl (TEAD Current Data)

		SWMU[a]									
GROUP	**RSA[b]**	**1b**	**1c**	**10**	**11**	**12**	**15**	**21**	**37**	**42**	**45**
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.016	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
A_D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BA	0.065	0.000	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.003	0.000
BE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BZALC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CD	0.080	0.000	0.001	0.000	0.000	0.000	0.008	0.000	0.000	0.008	0.000
CLDN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CR_CRHEX	0.305	0.000	0.001	0.000	0.002	0.001	0.009	0.000	0.000	0.002	0.001
CU	0.029	0.000	0.000	0.000	0.000	0.000	0.050	0.000	0.000	0.002	0.000
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.030	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.001	0.000
DIOXIN_FURAN	0.284	0.002	0.073	0.007	0.011	0.055	0.184	0.000	0.003	0.132	0.000
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ENDOSULFAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FE	0.550	0.000	0.004	0.000	0.003	0.001	0.022	0.000	0.000	0.003	0.001
HG	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MN	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.763	0.000	0.002	0.000	0.026	0.006	0.039	0.000	0.000	0.092	0.008
PCB_S	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.375	0.000	0.002	0.000	0.001	0.001	0.009	0.000	0.000	0.005	0.000
TL	0.993	0.000	0.006	0.001	0.001	0.005	0.016	0.000	0.000	0.011	0.002
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.438	0.000	0.001	0.000	0.012	0.003	0.060	0.000	0.000	0.001	0.001
HI[d] TOTAL	**4.0**	**0.0**	**0.1**	**0.01**	**0.1**	**0.1**	**0.4**	**0.0**	**0.0**	**0.3**	**0.0**

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-39. Final Hazard Indices for All Exposure Pathways for the Great Horned Owl (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	ND	ND	ND
24D	ND	ND	ND
AG	0.008	0.000	0.000
AL	ND	ND	ND
AS	0.016	0.000	0.001
A_D	0.000	0.000	0.000
BA	0.065	0.001	0.003
BE	0.000	0.000	0.000
BZALC	0.000	0.000	0.000
CD	0.080	0.003	0.013
CLDN	0.000	0.000	0.000
CO	0.000	0.000	0.000
CR_CRHEX	0.305	0.007	0.009
CU	0.029	0.002	0.016
DCB	ND	ND	ND
DDT_R	0.030	0.001	0.003
DIOXIN_FURAN	0.284	0.003	0.335
DN_TOL	ND	ND	ND
E_I	0.005	0.001	0.000
ENDOSULFAN	0.000	0.000	0.000
FE	0.550	0.007	0.024
HG	0.003	0.000	0.000
HMX	ND	ND	ND
H_HE	0.000	0.000	0.000
LIN	0.000	0.000	0.000
MN	0.013	0.000	0.000
NB	ND	ND	ND
NI	0.007	0.000	0.000
NNDPA	ND	ND	ND
PAH	ND	ND	ND
PB	0.763	0.064	0.149
PCB_S	0.007	0.001	0.000
PHENOL	ND	ND	ND
PHTLAT	0.005	0.002	0.000
RDX	ND	ND	ND
SB	ND	ND	ND
SE	0.375	0.001	0.011
TL	0.993	0.013	0.028
TPHC	ND	ND	ND
V	ND	ND	ND
ZN	0.438	0.007	0.063
HI[d] TOTAL	4.0	0.1	0.7

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-40. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Golden Eagle (TEAD Historic Data)

		SWMU[a]														
Group	**RSA[b]**	**01**	**1b**	**1c**	**03**	**04**	**06**	**07**	**08**	**10**	**11**	**12**	**13**	**14**	**15**	**19**
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.001	0.0004	ND	ND	0.00001	ND	0.00001	ND	4.55E-07	ND	2.05E-06	ND	ND	0.0002	0.0001	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.018	ND	ND	ND	ND	5.55E-07	0.0003	0.001	0.00001	ND	0.0001	0.0001	ND	0.00004	0.001	ND
A_D	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.93E-06	7.05E-07	ND	ND	0.00003	ND
BA	0.024	0.012	ND	ND	ND	1.38E-06	0.0003	0.001	0.00002	ND	0.0002	ND	ND	0.0001	0.001	ND
BE	0.0002	0.00001	ND	ND	ND	8.39E-09	ND	1.97E-06	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.0005	ND	ND	ND	ND	7.95E-08	ND	ND	ND	ND	ND	ND	ND	0.00002	ND	ND
CD	0.025	0.029	0.00003	ND	8.61E-07	0.00003	0.0004	0.0005	ND	ND	0.0005	ND	ND	0.002	0.003	0.0001
CLDN	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.70E-06	ND	ND	ND	ND
CO	0.0002	0.00001	ND	ND	3.59E-09	1.83E-08	9.42E-07	2.98E-06	1.03E-07	ND	1.36E-07	ND	ND	ND	4.22E-06	ND
CR_CRHEX	0.275	0.023	ND	ND	0.00005	0.0002	0.002	0.006	0.0002	ND	0.004	ND	0.001	0.003	0.083	0.0002
CU	0.009	0.152	ND	ND	8.83E-07	1.13E-06	0.0001	0.0001	0.00004	ND	0.003	ND	ND	0.0002	0.003	0.0001
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	ND
DIOXIN_FURAN	0.331	ND	1.38E-07	2.71E-06	ND	ND	ND	ND	ND	0.00004	2.84E-06	ND	ND	ND	0.002	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	ND	ND	ND	ND
ENDOSULFAN	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0004	ND
FE	0.791	0.094	ND	ND	ND	0.0001	0.007	0.019	0.001	ND	0.006	ND	ND	ND	0.028	0.001
HG	0.0004	0.0001	ND	ND	7.73E-08	1.70E-08	0.00001	ND	1.55E-07	ND	0.00004	ND	2.27E-06	0.00002	0.00003	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	0.00005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.017	ND	ND	ND	ND	7.90E-07	ND	0.0005	ND	ND	0.0001	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.010	0.001	ND	ND	ND	1.10E-06	0.00005	0.0002	0.00001	ND	0.0003	ND	ND	0.00003	0.0002	0.00001
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.042	0.367	0.00001	ND	7.14E-07	0.00002	0.009	0.001	0.003	ND	0.005	0.001	0.0001	0.0003	0.005	0.0001
PCB_S	0.014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.009	ND	ND	ND	8.66E-08	4.83E-07	ND	ND	ND	ND	0.001	ND	0.0001	0.0001	0.0001	0.00001
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.009	ND	ND	ND	3.71E-07	ND	ND	ND	ND	ND	0.002	ND	ND	0.0001	0.0002	ND
TL	2.482	0.067	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00003	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.052	0.592	ND	ND	2.69E-06	0.00002	0.001	0.004	0.00004	ND	0.004	ND	ND	0.001	0.006	0.003
HI[d]_TOTAL	**4.1**	**1.3**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	**0.03**	**0.00**	**0.00**	**0.03**	**0.00**	**0.00**	**0.01**	**0.1**	**0.00**

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Table 7-40. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Golden Eagle (TEAD Historic Data) (continued)*

Group	RSA	SWMU 20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.001	ND	5.86E-07	1.92E-08	2.24E-07	0.000	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	5.08E-07
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.018	0.00002	1.06E-06	5.74E-07	0.00001	0.000	0.0002	0.00001	0.00002	0.0002	0.0001	ND	4.94E-07	4.12E-07	0.001	0.00001
A_D	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.12E-08	ND	ND
BA	0.024	0.0002	0.0001	ND	0.0001	0.000	ND	ND	ND	ND	0.0004	ND	ND	ND	ND	0.00003
BE	0.0002	ND	1.39E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.0005	ND	ND	ND	2.37E-07	ND	ND	ND	ND	ND	ND	ND	3.17E-08	ND	ND	ND
CD	0.025	0.0005	0.0005	ND	0.00005	0.000	0.001	0.0001	0.0001	0.0001	0.002	ND	2.23E-06	1.35E-06	0.0001	ND
CLDN	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00001	ND
CO	0.0002	ND	8.57E-09	2.81E-09	3.52E-08	0.000	ND	ND	ND	ND	1.22E-06	ND	ND	ND	1.39E-06	5.39E-08
CR_CRHEX	0.275	0.001	0.001	0.00001	0.0004	0.001	0.013	0.001	0.0003	0.004	0.015	ND	0.00001	0.00001	ND	0.0002
CU	0.009	0.0004	0.0002	1.44E-07	0.00003	0.00003	0.001	4.33E-06	0.00001	ND	0.0001	ND	2.08E-07	3.14E-07	0.0001	0.0001
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.001	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	ND	ND	ND	0.0001	0.0003	ND
DIOXIN_FURA	0.331	ND	1.93E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00003	0.007	ND
ENDOSULFAN	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	0.791	0.001	0.0001	0.00002	0.0005	0.003	ND	ND	ND	ND	0.008	ND	ND	ND	0.007	0.001
HG	0.0004	4.90E-07	2.45E-08	ND	1.57E-07	0.00001	3.50E-06	0.00001	ND	ND	4.06E-06	ND	ND	ND	ND	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.80E-06	0.0001	ND
LIN	0.00005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.83E-08	0.0001	ND
MN	0.017	ND	1.96E-06	ND	ND	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.010	0.00003	2.98E-06	2.53E-07	1.82E-06	0.00001	0.0001	2.88E-06	ND	ND	0.0001	ND	ND	2.17E-07	ND	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.042	0.003	0.001	8.84E-07	0.0001	0.001	0.004	0.0001	0.0001	0.0004	0.002	0.00004	1.58E-06	4.73E-06	0.001	0.0003
PCB_S	0.014	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.009	0.00001	2.97E-07	ND	6.40E-07	ND	ND	ND	2.96E-06	ND	ND	1.75E-06	ND	ND	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.009	ND	2.85E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.85E-07	ND	ND
TL	2.482	0.002	0.000	ND	ND	ND	0.006	0.0004	0.001	ND	ND	ND	ND	0.000	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	0.001	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.052	0.001	0.0004	2.77E-06	0.0002	0.0001	0.014	0.0001	ND	0.001	0.001	ND	ND	0.00001	0.001	0.0001
HI_TOTAL	**4.1**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.00**	**0.00**	**0.01**	**0.03**	**0.00**	**0.00**	**0.00**	**0.02**	**0.00**

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Table 7-40. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Golden Eagle (TEAD Historic Data) (continued)

Group	RSA	37	38	40	42	45	46	47
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.001	ND	ND	0.00001	0.0002	3.68E-06	ND	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.018	ND	ND	0.0003	0.001	0.0002	4.10E-07	ND
A_D	0.0001	ND	ND	ND	ND	0.0002	ND	ND
BA	0.024	ND	ND	0.001	0.024	0.0001	ND	ND
BE	0.0002	ND	ND	ND	0.000	ND	ND	ND
BZALC	0.0005	ND	ND	ND	ND	ND	ND	ND
CD	0.025	0.00001	2.00E-06	0.0004	0.005	0.0003	3.03E-06	ND
CLDN	0.0002	ND	ND	ND	ND	0.0001	ND	ND
CO	0.0002	ND	ND	1.31E-06	2.28E-06	2.75E-07	ND	ND
CR_CRHEX	0.275	ND	ND	0.003	0.023	0.002	0.00003	ND
CU	0.009	ND	6.45E-07	0.0002	0.018	0.0001	5.44E-07	ND
DCB	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.001	ND	ND	ND	0.003	0.001	ND	ND
DIOXIN_FURA	0.331	0.0001	ND	ND	0.009	0.00002	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.009	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	0.000	ND	ND	ND	ND	ND	ND	ND
FE	0.791	ND	ND	0.009	0.015	0.00003	0.00004	ND
HG	0.0004	ND	3.07E-08	3.10E-06	0.00001	1.84E-06	5.13E-08	3.59E-07
HMX	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.0002	ND	ND	ND	ND	ND	ND	ND
LIN	0.00005	ND	ND	ND	ND	ND	ND	ND
MN	0.017	ND	ND	ND	0.0002	0.00001	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.010	ND	ND	0.0001	0.0004	0.00002	4.06E-07	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.042	0.00001	2.68E-06	0.002	0.200	0.001	0.00001	0.0001
PCB_S	0.014	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.009	1.89E-07	2.23E-08	ND	0.00002	0.0003	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.009	ND	ND	ND	ND	ND	ND	ND
TL	2.482	ND	0.0001	ND	0.039	0.004	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	0.00004	0.002
V	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.052	0.0001	ND	0.001	0.015	0.001	0.00001	ND
HI_TOTAL	**4.1**	**0.00**	**0.00**	**0.02**	**0.4**	**0.01**	**0.00**	**0.00**

[a]Solid Waste Management Unit [c]No Data or Pathway Incomplete
[b]Reference Study Area [d]Hazard Index

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Table 7-41. Final Hazard Indices for All Exposure Pathways for the Golden Eagle (TEAD Current Data)

		SWMU[a]									
GROUP	**RSA[b]**	**1b**	**1c**	**10**	**11**	**12**	**15**	**21**	**37**	**42**	**45**
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.031	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.000
A_D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BA	0.130	0.000	0.001	0.000	0.000	0.001	0.004	0.000	0.000	0.006	0.000
BE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BZALC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CD	0.149	0.000	0.001	0.000	0.001	0.001	0.016	0.000	0.000	0.014	0.001
CLDN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CR_CRHEX	0.611	0.000	0.002	0.000	0.004	0.001	0.018	0.000	0.000	0.004	0.003
CU	0.059	0.000	0.000	0.000	0.001	0.000	0.101	0.000	0.000	0.004	0.001
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.030	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.001	0.000
DIOXIN_FURAN	0.569	0.004	0.146	0.015	0.022	0.110	0.369	0.001	0.005	0.264	0.001
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ENDOSULFAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FE	1.099	0.000	0.008	0.000	0.006	0.003	0.045	0.000	0.000	0.007	0.003
HG	0.006	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MN	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	1.223	0.000	0.003	0.000	0.042	0.010	0.063	0.001	0.000	0.148	0.012
PCB_S	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.009	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.697	0.000	0.004	0.000	0.002	0.003	0.016	0.000	0.000	0.009	0.000
TL	2.482	0.000	0.016	0.002	0.002	0.012	0.039	0.000	0.001	0.028	0.004
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.876	0.000	0.001	0.000	0.024	0.007	0.121	0.000	0.000	0.003	0.002
HI[d] TOTAL	**8.1**	**0.0**	**0.2**	**0.02**	**0.1**	**0.1**	**0.8**	**0.0**	**0.01**	**0.5**	**0.0**

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-42. Final Hazard Indices for All Exposure Pathways for the Golden Eagle (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	ND	ND	ND
24D	ND	ND	ND
AG	0.016	0.000	0.000
AL	ND	ND	ND
AS	0.031	0.001	0.001
A_D	0.000	0.000	0.000
BA	0.130	0.002	0.007
BE	0.000	0.000	0.000
BZALC	0.000	0.000	0.000
CD	0.149	0.006	0.025
CLDN	0.000	0.000	0.000
CO	0.000	0.000	0.000
CR_CRHEX	0.611	0.013	0.017
CU	0.059	0.005	0.033
DCB	ND	ND	ND
DDT_R	0.030	0.001	0.003
DIOXIN_FURAN	0.569	0.006	0.671
DN_TOL	ND	ND	ND
E_I	0.009	0.001	0.000
ENDOSULFAN	0.000	0.000	0.000
FE	1.099	0.015	0.047
HG	0.006	0.000	0.000
HMX	ND	ND	ND
H_HE	0.000	0.000	0.000
LIN	0.000	0.000	0.000
MN	0.026	0.000	0.001
NB	ND	ND	ND
NI	0.015	0.000	0.001
NNDPA	ND	ND	ND
PAH	ND	ND	ND
PB	1.223	0.103	0.239
PCB_S	0.014	0.002	0.000
PHENOL	ND	ND	ND
PHTLAT	0.009	0.004	0.001
RDX	ND	ND	ND
SB	ND	ND	ND
SE	0.697	0.003	0.020
TL	2.482	0.032	0.071
TPHC	ND	ND	ND
V	ND	ND	ND
ZN	0.876	0.014	0.126
HI[d] TOTAL	**8.1**	**0.2**	**1.3**

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-43. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Bald Eagle (TEAD Historic Data)

Group	RSA[b]	SWMU[a] 01	1b	1c	03	04	06	07	08	10	11	12	13	14	15	19
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.001	0.0004	ND	ND	0.00001	ND	0.00001	ND	4.55E-07	ND	2.05E-06	ND	ND	0.0002	0.0001	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.018	ND	ND	ND	ND	5.55E-07	0.0003	0.001	0.00001	ND	0.0001	0.0001	ND	0.00004	0.001	ND
A_D	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.93E-06	7.05E-07	ND	ND	0.00003	ND
BA	0.024	0.012	ND	ND	ND	1.38E-06	0.0003	0.001	0.00002	ND	0.0002	ND	ND	0.0001	0.001	ND
BE	0.0002	0.00001	ND	ND	ND	8.39E-09	ND	1.97E-06	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.0005	ND	ND	ND	ND	7.95E-08	ND	ND	ND	ND	ND	ND	ND	0.00002	ND	ND
CD	0.025	0.029	0.00003	ND	8.61E-07	0.00003	0.0004	0.0005	ND	ND	0.0005	ND	ND	0.002	0.003	0.000
CLDN	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.70E-06	ND	ND	ND	ND
CO	0.0002	0.00001	ND	ND	3.59E-09	1.83E-08	9.42E-07	2.98E-06	1.03E-07	ND	1.36E-07	ND	ND	ND	4.22E-06	ND
CR_CRHEX	0.275	0.023	ND	ND	0.00005	0.0002	0.002	0.006	0.0002	ND	0.004	ND	0.001	0.003	0.083	0.0002
CU	0.009	0.152	ND	ND	8.83E-07	1.13E-06	0.0001	0.0001	0.00004	ND	0.003	ND	ND	0.0002	0.003	0.0001
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	ND
DIOXIN_FURAN	0.331	ND	1.38E-07	2.71E-06	ND	ND	ND	ND	ND	0.00004	2.84E-06	ND	ND	ND	0.002	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	ND	ND	ND	ND
ENDOSULFAN	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0004	ND
FE	0.791	0.094	ND	ND	ND	0.0001	0.007	0.019	0.001	ND	0.006	ND	ND	ND	0.028	0.001
HG	0.0004	0.0001	ND	ND	7.73E-08	1.70E-08	0.00001	ND	1.55E-07	ND	0.00004	ND	2.27E-06	0.00002	0.00003	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	0.00005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.017	ND	ND	ND	ND	7.90E-07	ND	0.0005	ND	ND	0.0001	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.010	0.001	ND	ND	ND	1.10E-06	0.00005	0.0002	0.00001	ND	0.0003	ND	ND	0.00003	0.0002	0.00001
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.042	0.367	0.00001	ND	7.14E-07	0.00002	0.009	0.001	0.003	ND	0.005	0.001	0.0001	0.0003	0.005	0.0001
PCB_S	0.014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.009	ND	ND	ND	8.66E-08	4.83E-07	ND	ND	ND	ND	0.001	ND	0.0001	0.0001	0.0001	0.00001
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.009	ND	ND	ND	3.71E-07	ND	ND	ND	ND	ND	0.002	ND	ND	0.0001	0.0002	ND
TL	2.482	0.067	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00003	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.052	0.592	ND	ND	2.69E-06	0.00002	0.001	0.004	0.00004	ND	0.004	ND	ND	0.001	0.006	0.003
HI[d]_TOTAL	**4.1**	**1.3**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	**0.03**	**0.00**	**0.00**	**0.03**	**0.00**	**0.00**	**0.01**	**0.1**	**0.00**

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Table 7-43. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Bald Eagle (TEAD Historic Data) (continued)

Group	RSA	SWMU														
		20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.001	ND	5.86E-07	1.92E-08	2.24E-07	0.00001	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	5.08E-07
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.018	0.00002	1.06E-06	5.74E-07	0.00001	0.00003	0.0002	0.00001	0.00002	0.0002	0.0001	ND	4.94E-07	4.12E-07	0.001	0.00001
A_D	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.12E-08	ND	ND
BA	0.024	0.0002	0.0001	ND	0.0001	0.00003	ND	ND	ND	ND	0.0004	ND	ND	ND	ND	0.00003
BE	0.0002	ND	1.39E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.0005	ND	ND	ND	2.37E-07	ND	ND	ND	ND	ND	ND	ND	3.17E-08	ND	ND	ND
CD	0.025	0.0005	0.0005	ND	0.00005	0.0001	0.001	0.0001	0.0001	0.0001	0.002	ND	2.23E-06	1.35E-06	0.0001	ND
CLDN	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00001	ND
CO	0.0002	ND	8.57E-09	2.81E-09	3.52E-08	1.14E-07	ND	ND	ND	ND	0.000	ND	ND	ND	1.39E-06	5.39E-08
CR_CRHEX	0.275	0.001	0.001	0.00001	0.0004	0.001	0.013	0.001	0.0003	0.004	0.015	ND	0.00001	0.00001	ND	0.0002
CU	0.009	0.0004	0.0002	1.44E-07	0.00003	0.00003	0.001	4.33E-06	0.00001	ND	0.0001	ND	2.08E-07	3.14E-07	0.0001	0.0001
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	ND	ND	ND	0.00002	0.0001	ND
DIOXIN_FURAN	0.331	ND	1.93E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00003	0.007	ND
ENDOSULFAN	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	0.791	0.001	0.0001	0.00002	0.0005	0.003	ND	ND	ND	ND	0.008	ND	ND	ND	0.007	0.001
HG	0.0004	4.90E-07	2.45E-08	ND	1.57E-07	0.00001	3.50E-06	0.00001	ND	ND	4.06E-06	ND	ND	ND	ND	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.80E-06	0.0001	ND
LIN	0.00005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.83E-08	0.0001	ND
MN	0.017	ND	1.96E-06	ND	ND	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.010	0.00003	2.98E-06	2.53E-07	1.82E-06	0.00001	0.0001	2.88E-06	ND	ND	0.0001	ND	ND	2.17E-07	ND	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.042	0.003	0.001	8.84E-07	0.0001	0.001	0.004	0.0001	0.0001	0.0004	0.002	0.00004	1.58E-06	4.73E-06	0.001	0.0003
PCB_S	0.014	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.009	0.00001	2.97E-07	ND	6.40E-07	ND	ND	ND	2.96E-06	ND	ND	1.75E-06	ND	ND	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.009	ND	2.85E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.85E-07	ND	ND
TL	2.482	0.002	0.0002	ND	ND	ND	0.006	0.0004	0.001	ND	ND	ND	ND	0.00003	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	0.001	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.052	0.001	0.0004	2.77E-06	0.0002	0.0001	0.014	0.0001	ND	0.001	0.001	ND	ND	0.00001	0.001	0.0001
HI_TOTAL	4.1	0.01	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.02	0.00

Table 7-43. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Bald Eagle (TEAD Historic Data) (continued)

Group	RSA	SWMU 37	38	40	42	45	46	47
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.001	ND	ND	0.00001	0.0002	3.68E-06	ND	ND
AL	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.018	ND	ND	0.0003	0.001	0.0002	4.10E-07	ND
A_D	0.0001	ND	ND	ND	ND	0.0002	ND	ND
BA	0.024	ND	ND	0.001	0.024	0.0001	ND	ND
BE	0.0002	ND	ND	ND	1.77E-06	ND	ND	ND
BZALC	0.0005	ND	ND	ND	ND	ND	ND	ND
CD	0.025	0.00001	2.00E-06	0.0004	0.005	0.0003	3.03E-06	ND
CLDN	0.0002	ND	ND	ND	ND	0.0001	ND	ND
CO	0.0002	ND	ND	1.31E-06	2.28E-06	2.75E-07	ND	ND
CR_CRHEX	0.275	ND	ND	0.003	0.023	0.002	0.00003	ND
CU	0.009	ND	6.45E-07	0.0002	0.018	0.0001	5.44E-07	ND
DCB	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.000	ND	ND	ND	0.001	0.001	ND	ND
DIOXIN_FURAN	0.331	0.0001	ND	ND	0.009	0.00002	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.009	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	0.0001	ND	ND	ND	ND	ND	ND	ND
FE	0.791	ND	ND	0.009	0.015	0.00003	0.00004	ND
HG	0.0004	ND	3.07E-08	3.10E-06	0.00001	1.84E-06	5.13E-08	3.59E-07
HMX	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.0002	ND	ND	ND	ND	ND	ND	ND
LIN	0.00005	ND	ND	ND	ND	ND	ND	ND
MN	0.017	ND	ND	ND	0.0002	0.00001	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.010	ND	ND	0.0001	0.0004	0.00002	4.06E-07	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND
PB	0.042	0.00001	2.68E-06	0.002	0.200	0.001	0.00001	0.0001
PCB_S	0.014	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.009	1.89E-07	2.23E-08	ND	0.00002	0.0003	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.009	ND	ND	ND	ND	ND	ND	ND
TL	2.482	ND	0.0001	ND	0.039	0.004	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	0.00004	0.002
V	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.052	0.0001	ND	0.001	0.015	0.001	0.00001	ND
HI_TOTAL	**4.1**	**0.00**	**0.00**	**0.02**	**0.3**	**0.01**	**0.00**	**0.00**

[a]Solid Waste Management Unit [c]No Data or Pathway Incomplete
[b]Reference Study Area [d]Hazard Index

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Table 7-44. Final Hazard Indices for All Exposure Pathways for the Bald Eagle (TEAD Current Data)

		SWMU[a]									
GROUP	RSA[b]	1b	1c	10	11	12	15	21	37	42	45
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.031	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.000
A_D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BA	0.130	0.000	0.001	0.000	0.000	0.001	0.004	0.000	0.000	0.006	0.000
BE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BZALC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CD	0.149	0.000	0.001	0.000	0.001	0.001	0.016	0.000	0.000	0.014	0.001
CLDN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CR_CRHEX	0.611	0.000	0.002	0.000	0.004	0.001	0.018	0.000	0.000	0.004	0.003
CU	0.059	0.000	0.000	0.000	0.001	0.000	0.101	0.000	0.000	0.004	0.001
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.012	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000
DIOXIN_FURAN	0.569	0.004	0.146	0.015	0.022	0.110	0.369	0.001	0.005	0.264	0.001
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ENDOSULFAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FE	1.099	0.000	0.008	0.000	0.006	0.003	0.045	0.000	0.000	0.007	0.003
HG	0.006	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MN	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PB	1.223	0.000	0.003	0.000	0.042	0.010	0.063	0.001	0.000	0.148	0.012
PCB_S	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.009	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.697	0.000	0.004	0.000	0.002	0.003	0.016	0.000	0.000	0.009	0.000
TL	2.482	0.000	0.016	0.002	0.002	0.012	0.039	0.000	0.001	0.028	0.004
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.876	0.000	0.001	0.000	0.024	0.007	0.121	0.000	0.000	0.003	0.002
HI[d] TOTAL	8.0	0.0	0.2	0.02	0.1	0.1	0.8	0.0	0.01	0.5	0.0

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-45. Final Hazard Indices for All Exposure Pathways for the Bald Eagle (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	ND	ND	ND
24D	ND	ND	ND
AG	0.016	0.000	0.000
AL	ND	ND	ND
AS	0.031	0.001	0.001
A_D	0.000	0.000	0.000
BA	0.130	0.002	0.007
BE	0.000	0.000	0.000
BZALC	0.000	0.000	0.000
CD	0.149	0.006	0.025
CLDN	0.000	0.000	0.000
CO	0.000	0.000	0.000
CR_CRHEX	0.611	0.013	0.017
CU	0.059	0.005	0.033
DCB	ND	ND	ND
DDT_R	0.012	0.000	0.001
DIOXIN_FURAN	0.569	0.006	0.671
DN_TOL	ND	ND	ND
E_I	0.009	0.001	0.000
ENDOSULFAN	0.000	0.000	0.000
FE	1.099	0.015	0.047
HG	0.006	0.000	0.000
HMX	ND	ND	ND
H_HE	0.000	0.000	0.000
LIN	0.000	0.000	0.000
MN	0.026	0.000	0.001
NB	ND	ND	ND
NI	0.015	0.000	0.001
NNDPA	ND	ND	ND
PAH	ND	ND	ND
PB	1.223	0.103	0.239
PCB_S	0.014	0.002	0.000
PHENOL	ND	ND	ND
PHTLAT	0.009	0.004	0.001
RDX	ND	ND	ND
SB	ND	ND	ND
SE	0.697	0.003	0.020
TL	2.482	0.032	0.071
TPHC	ND	ND	ND
V	ND	ND	ND
ZN	0.876	0.014	0.126
HI[d] TOTAL	**8.0**	**0.2**	**1.3**

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-46. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Deer Mouse (TEAD Historic Data)*

		SWMU[a]														
Group	**RSA[b]**	**01**	**1b**	**1c**	**03**	**04**	**06**	**07**	**08**	**10**	**11**	**12**	**13**	**14**	**15**	**19**
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.089	54.597	ND	ND	ND	ND	ND	ND	ND	25.511	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.0003	0.002	ND	ND	0.016	ND	0.0003	ND	0.0003	ND	0.001	ND	ND	0.063	0.001	ND
AL	4.798	11.263	ND	ND	ND	ND	ND	11.774	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.059	ND	ND	ND	ND	0.011	0.195	0.178	0.065	ND	0.090	0.084	ND	0.146	0.193	ND
A_D	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.048	0.002	ND	ND	0.032	ND
BA	0.181	1.615	ND	ND	ND	0.063	0.395	0.394	0.434	ND	0.249	ND	ND	0.805	0.460	ND
BE	0.0004	0.001	ND	ND	ND	0.0001	ND	0.0003	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.0001	ND	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND	ND	0.003	ND	ND
CD	0.006	0.139	0.051	ND	0.001	0.042	0.016	0.009	ND	ND	0.137	ND	ND	0.441	0.047	0.025
CLDN	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.010	ND	ND	ND	ND
CO	0.647	0.513	ND	ND	0.070	0.359	0.521	0.749	0.814	ND	0.465	ND	ND	ND	0.867	ND
CR_CRHEX	0.027	0.042	ND	ND	0.029	0.100	0.036	0.044	0.046	ND	0.094	ND	0.025	0.325	0.527	0.034
CU	0.098	29.900	ND	ND	0.058	0.074	0.258	0.093	1.138	ND	29.415	ND	ND	2.312	1.913	2.318
DCB	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005	ND	ND	ND
DDT_R	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	ND
DIOXIN_FURAN	2.042	ND	0.005	0.003	ND	ND	ND	ND	ND	0.425	0.019	ND	ND	ND	0.793	ND
DN_TOL	0.184	0.298	ND	ND	ND	ND	0.426	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0003	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	14.466	31.511	ND	ND	ND	7.580	21.512	26.658	28.121	ND	72.428	ND	ND	ND	32.710	37.750
HG	0.001	0.002	ND	ND	0.001	0.0002	0.002	ND	0.001	ND	0.014	ND	0.001	0.050	0.005	ND
HMX	0.004	0.046	ND	ND	ND	ND	ND	ND	ND	0.046	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.096	ND	ND	ND	ND	0.027	ND	0.213	ND	ND	0.305	ND	ND	ND	ND	ND
NB	0.013	0.115	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.008	0.012	ND	ND	ND	0.006	0.007	0.011	0.014	ND	0.037	ND	ND	0.026	0.008	0.009
NNDPA	2.89E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.026	ND	ND	ND	ND	0.003	ND	ND	ND	ND	0.001	0.095	0.001	0.031	1.362	0.006
PB	0.175	27.964	0.181	ND	0.018	0.532	6.363	0.294	33.365	ND	22.438	0.472	0.077	1.572	1.225	0.912
PCB_S	0.006	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.007	ND
PHENOL	0.00001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.001	ND	ND	ND	0.00005	0.0003	ND	ND	ND	ND	0.006	ND	0.001	0.006	0.0003	0.001
RDX	0.081	12.595	ND	ND	ND	ND	ND	ND	ND	9.840	ND	ND	ND	ND	ND	0.383
SB	0.022	0.532	ND	ND	ND	0.022	ND	ND	1.208	ND	3.256	ND	ND	ND	0.504	ND
SE	0.040	ND	ND	ND	0.010	ND	ND	ND	ND	ND	0.085	ND	ND	0.432	0.064	ND
TL	5.061	2.503	ND	ND	ND	1.260	ND	ND	ND	ND	ND	ND	ND	3.250	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.014	ND	ND	ND	ND	ND
V	0.224	ND	ND	ND	ND	ND	0.350	0.469	0.455	ND	ND	ND	ND	ND	0.486	ND
ZN	0.063	13.158	ND	ND	0.020	0.146	0.236	0.341	0.108	ND	0.979	ND	ND	1.641	0.450	4.765
HI[d]_TOTAL	**28.4**	**186.8**	**0.2**	**0.00**	**0.2**	**10.2**	**30.3**	**41.2**	**65.8**	**35.8**	**130.1**	**0.7**	**0.11**	**11.1**	**41.7**	**46.2**

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Table 7-46. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Deer Mouse (TEAD Historic Data) (continued)*

Group	RSA	SWMU 20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.089	ND	66.767	27.423	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.0003	ND	0.001	0.00003	0.0003	0.003	0.0005	ND	ND	ND	ND	ND	ND	0.262	ND	ND
AL	4.798	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.862	ND	ND	ND	ND	0.0003
AS	0.059	0.047	0.022	0.012	0.136	0.109	0.055	0.111	0.133	0.114	0.066	ND	0.010	0.008	0.430	0.070
A_D	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND
BA	0.181	1.126	2.141	ND	0.242	0.296	ND	ND	ND	ND	0.430	ND	ND	ND	ND	0.427
BE	0.0004	ND	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.0001	ND	ND	ND	0.0002	ND	ND	ND	ND	ND	ND	ND	0.00003	ND	ND	ND
CD	0.006	0.092	0.733	ND	0.059	0.023	0.041	0.140	0.069	0.006	0.071	ND	0.004	0.002	0.006	ND
CLDN	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.038	ND
CO	0.647	ND	0.168	0.055	0.556	0.449	ND	ND	ND	ND	0.596	ND	ND	ND	0.863	0.370
CR_CRHEX	0.027	0.067	0.682	0.004	0.174	0.066	0.134	0.545	0.051	0.092	0.232	ND	0.007	0.004	ND	0.033
CU	0.098	2.819	10.953	0.009	0.273	0.460	1.569	0.230	0.114	ND	0.185	ND	0.014	0.021	0.107	1.447
DCB	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.000	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND	0.010	0.002	ND
DIOXIN_FURAN	2.042	ND	0.371	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	0.184	ND	0.029	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	0.013	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	14.466	16.310	15.496	2.154	22.348	67.083	ND	ND	ND	ND	23.264	ND	ND	ND	25.889	24.189
HG	0.001	0.001	0.000	ND	0.002	0.016	0.001	0.139	ND	ND	0.001	ND	ND	ND	ND	ND
HMX	0.004	ND	ND	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.096	ND	0.067	ND	ND	0.140	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	0.013	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.008	0.018	0.015	0.001	0.008	0.007	0.008	0.012	ND	ND	0.011	ND	ND	0.001	ND	ND
NNDPA	2.89E-06	ND	3.15E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.026	0.008	0.001	ND	0.082	ND	0.019	ND	ND	0.010	ND	0.013	0.000	ND	ND	ND
PB	0.175	9.666	28.745	0.022	0.990	5.276	1.844	2.996	0.618	0.361	1.114	0.239	0.040	0.120	0.429	2.634
PCB_S	0.006	ND	ND	ND	0.254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	0.00001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.001	0.001	0.0002	ND	0.0003	ND	ND	ND	0.001	ND	ND	0.0003	ND	ND	ND	ND
RDX	0.081	ND	0.044	2.029	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	0.022	0.703	2.332	ND	ND	0.356	0.220	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.040	ND	0.074	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005	ND	ND
TL	5.061	2.357	2.580	ND	ND	ND	1.298	4.049	4.085	ND	ND	ND	ND	0.351	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	0.121	0.047	ND	ND	ND	ND	ND	ND
V	0.224	ND	ND	ND	ND	0.890	ND	ND	ND	ND	0.411	ND	ND	ND	ND	ND
ZN	0.063	0.943	2.892	0.020	0.524	0.200	1.749	0.555	ND	0.246	0.277	ND	ND	0.058	0.141	0.303
HI_TOTAL	28.4	34.2	134.1	31.7	25.6	75.4	6.9	8.8	5.2	0.9	35.5	0.3	0.07	0.8	27.9	29.5

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Table 7-46. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Deer Mouse (TEAD Historic Data) (continued)*

Group	RSA	SWMU 37	38	40	42	45	46	47
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.089	0.044	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.0003	ND	ND	0.0003	0.004	0.001	ND	ND
AL	4.798	ND	ND	ND	ND	ND	ND	ND
AS	0.059	ND	ND	0.118	0.153	0.346	0.008	ND
A_D	0.001	ND	ND	ND	ND	1.928	ND	ND
BA	0.181	ND	ND	0.487	15.836	ND	ND	ND
BE	0.0004	ND	ND	ND	0.000	ND	ND	ND
BZALC	0.0001	ND	ND	ND	ND	ND	ND	ND
CD	0.006	0.007	0.003	0.012	0.113	0.045	0.005	ND
CLDN	0.001	ND	ND	ND	ND	0.812	ND	ND
CO	0.647	ND	ND	0.449	0.650	0.566	ND	ND
CR_CRHEX	0.027	ND	ND	0.031	0.201	0.109	0.015	ND
CU	0.098	ND	0.042	0.200	17.522	0.490	0.036	ND
DCB	0.0004	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.00002	ND	ND	ND	0.008	0.027	ND	ND
DIOXIN_FURAN	2.042	26.907	ND	ND	11.620	0.077	ND	ND
DN_TOL	0.184	ND	ND	ND	0.642	ND	ND	ND
E_I	0.0001	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND
FE	14.466	ND	ND	17.834	24.556	ND	4.498	ND
HG	0.001	ND	0.0004	0.001	0.002	0.003	0.001	0.003
HMX	0.004	ND	ND	0.101	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.096	ND	ND	ND	0.112	ND	ND	ND
NB	0.013	ND	ND	ND	ND	ND	ND	ND
NI	0.008	ND	ND	0.007	0.034	0.013	0.002	ND
NNDPA	2.89E-06	ND	ND	ND	ND	ND	ND	ND
PAH	0.026	0.074	0.003	ND	0.014	0.046	ND	ND
PB	0.175	0.221	0.068	0.796	73.963	2.205	0.327	1.725
PCB_S	0.006	ND	ND	ND	ND	ND	ND	ND
PHENOL	0.00001	ND	0.0001	ND	ND	ND	ND	ND
PHTLAT	0.001	0.0001	0.00001	ND	0.0002	0.005	ND	ND
RDX	0.081	ND	ND	18.073	ND	ND	ND	ND
SB	0.022	ND	ND	ND	14.646	ND	0.015	0.386
SE	0.040	ND	ND	ND	ND	ND	ND	ND
TL	5.061	ND	0.900	ND	7.104	4.888	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	0.091	2.874
V	0.224	ND	ND	0.393	ND	0.459	ND	ND
ZN	0.063	0.663	ND	0.109	1.602	0.473	0.045	ND
HI_TOTAL	**28.4**	**27.9**	**1.0**	**38.6**	**168.8**	**12.5**	**5.0**	**5.0**

[a]Solid Waste Management Unit
[b]Reference Study Area
[c]No Data or Pathway Incomplete
[d]Hazard Index

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Table 7-47. Final Hazard Indices for Soil and Dietary Pathways for the Deer Mouse (TEAD Current Data)

		SWMU[a]									
GROUP	**RSA[b]**	**1b**	**1c**	**10**	**11**	**12**	**15**	**21**	**37**	**42**	**45**
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	11.713	8.842	9.284	23.374	9.052	2.793	9.368	4.015	6.144	5.679	7.781
24D	1.616	0.895	0.939	0.939	0.939	0.730	0.854	0.224	0.854	0.854	1.211
AG	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002
AL	7.519	8.500	8.858	4.408	3.570	3.320	5.281	2.262	4.440	4.668	9.274
AS	0.142	0.096	0.184	0.275	0.304	0.373	0.778	0.120	0.181	0.478	0.519
A_D	0.001	0.001	0.001	0.001	0.003	0.002	0.013	0.000	0.017	0.001	0.126
BA	0.904	1.330	1.197	0.670	0.871	0.662	0.956	1.199	0.959	8.375	1.095
BE	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
BZALC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
CD	0.151	0.660	0.322	0.095	0.105	0.087	0.672	0.508	0.221	0.245	0.349
CLDN	0.001	0.001	0.001	0.001	0.001	0.010	0.001	0.000	0.001	0.001	0.058
CO	1.134	0.958	1.135	0.519	0.448	0.496	2.039	0.368	0.711	1.542	1.019
CR_CRHEX	0.061	0.065	0.066	0.047	0.083	0.047	0.136	0.033	0.053	0.069	0.171
CU	2.498	3.326	3.031	3.807	4.411	2.662	24.283	4.455	3.851	3.767	3.345
DCB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
DDT_R	0.004	0.004	0.007	0.005	0.010	0.002	0.006	0.004	0.006	0.007	0.006
DIOXIN_FURAN	21.895	9.099	8.475	48.420	50.080	7.908	14.300	26.432	73.710	5.138	5.835
DN_TOL	0.184	0.176	0.184	0.184	0.184	0.184	0.184	0.044	0.184	0.614	0.184
E_I	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	21.751	23.368	27.300	15.297	69.537	11.232	54.090	6.679	16.720	14.344	28.105
HG	0.013	0.017	0.016	0.018	0.016	0.015	0.037	0.013	0.016	0.021	0.022
HMX	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.001	0.004	0.004	0.004
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.404	0.482	0.549	0.279	0.291	0.208	0.260	0.110	0.227	0.287	0.378
NB	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.003	0.013	0.013	0.013
NI	0.043	0.026	0.041	0.018	0.045	0.028	0.031	0.014	0.044	0.051	0.039
NNDPA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PAH	0.029	0.026	0.028	0.029	0.030	0.120	15.532	0.008	0.141	0.047	1.256
PB	0.411	0.413	0.298	0.328	10.252	0.753	1.865	6.020	1.255	8.551	3.196
PCB_S	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.001	0.006	0.006	0.062
PHENOL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
PHTLAT	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.025
RDX	10.232	13.948	14.646	1434.955	13.982	8.999	9.531	3.487	9.531	9.668	15.022
SB	0.457	0.379	0.388	0.482	1.148	0.585	0.890	0.876	0.389	10.043	0.671
SE	1.811	1.330	1.389	1.571	1.568	1.635	1.760	1.450	2.239	1.760	2.411
TL	5.061	4.820	5.061	5.061	5.061	5.061	5.061	1.205	5.061	5.061	5.061
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	0.351	0.437	0.456	0.267	0.188	0.202	0.271	0.096	0.271	0.311	0.456
ZN	1.807	2.827	2.046	2.098	2.962	2.215	4.711	2.143	2.139	2.206	2.609
HI[d] TOTAL	**90.2**	**82.1**	**85.9**	**1543.2**	**175.2**	**50.4**	**152.9**	**61.8**	**129.4**	**83.8**	**90.340**

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-48. Final Hazard Indices for the Soil and Dietary Exposure Pathways for the Deer Mouse (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	11.713	6.677	9.914
24D	1.616	0.976	0.916
AG	0.002	0.002	0.002
AL	7.519	6.609	6.529
AS	0.142	0.481	0.401
A_D	0.001	0.048	0.006
BA	0.904	6.399	1.587
BE	0.001	0.000	0.000
BZALC	0.000	0.004	0.000
CD	0.151	0.339	0.474
CLDN	0.001	0.025	0.003
CO	1.134	1.324	1.047
CR_CRHEX	0.061	0.106	0.083
CU	2.498	3.590	8.010
DCB	0.000	0.021	0.000
DDT_R	0.004	0.007	0.007
DIOXIN_FURAN	21.895	6.281	76.418
DN_TOL	0.184	0.433	0.184
E_I	0.000	0.001	0.000
ENDOSULFAN	ND	ND	ND
FE	21.751	20.152	32.552
HG	0.013	0.021	0.021
HMX	0.004	0.004	0.004
H_HE	ND	ND	ND
LIN	ND	ND	ND
MN	0.404	0.331	0.319
NB	0.013	0.013	0.013
NI	0.043	0.046	0.043
NNDPA	0.000	0.000	0.000
PAH	0.029	1.211	2.901
PB	0.411	6.701	5.424
PCB_S	0.006	0.062	0.006
PHENOL	0.000	0.001	0.000
PHTLAT	0.001	0.025	0.001
RDX	10.232	11.662	151.647
SB	0.457	6.497	1.066
SE	1.811	2.328	1.850
TL	5.061	5.061	5.061
TPHC	ND	ND	ND
V	0.351	0.373	0.340
ZN	1.807	2.443	3.085
HI[d] TOTAL	**90.2**	**90.3**	**309.9**

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-49. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Mule Deer (TEAD Historic Data)*

		SWMU[a]														
Group	RSA[b]	01	1b	1c	03	04	06	07	08	10	11	12	13	14	15	19
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.007	3.821	ND	ND	ND	ND	ND	ND	ND	0.020	0.114	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.00002	0.0001	ND	ND	2.77E-06	ND	1.61E-06	ND	1.31E-07	ND	5.90E-07	ND	ND	0.0001	0.00002	ND
AL	0.480	0.986	ND	ND	ND	ND	ND	0.241	ND	ND	0.001	ND	ND	ND	ND	ND
AS	0.008	ND	ND	ND	ND	4.00E-06	0.002	0.005	0.0001	ND	0.0004	0.001	ND	0.000	0.006	ND
A_D	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	0.00001	ND	ND	0.001	ND
BA	0.024	0.189	ND	ND	ND	0.00002	0.005	0.011	0.0004	ND	0.001	ND	ND	0.002	0.015	ND
BE	0.0001	0.0001	ND	ND	ND	3.75E-08	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.00001	ND	ND	ND	ND	1.50E-08	ND	ND	ND	ND	ND	ND	ND	3.98E-06	ND	ND
CD	0.001	0.016	0.00002	ND	4.72E-07	0.00001	0.0002	0.0002	ND	ND	0.0003	ND	ND	0.001	0.002	0.00003
CLDN	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	ND	ND	ND	ND
CO	0.083	0.057	ND	ND	0.00002	0.0001	0.006	0.020	0.001	ND	0.001	ND	ND	ND	0.028	ND
CR_CRHEX	0.002	0.003	ND	ND	0.00001	0.00002	0.0003	0.001	0.00002	ND	0.0003	ND	0.0002	0.0004	0.011	0.00003
CU	0.008	2.093	ND	ND	0.00001	0.00002	0.002	0.002	0.001	ND	0.037	ND	ND	0.003	0.038	0.002
DCB	0.00004	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0003	ND	0.00004	ND	ND	ND
DDT_R	2.41E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00001	ND
DIOXIN_FURAN	0.270	ND	0.000	0.000	ND	ND	ND	ND	ND	0.001	0.00004	ND	ND	ND	0.026	ND
DN_TOL	0.015	0.021	ND	ND	ND	ND	0.003	ND	ND	ND	0.002	ND	ND	ND	ND	ND
E_I	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.82E-06	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	1.930	3.678	ND	ND	ND	0.003	0.267	0.727	0.024	ND	0.190	ND	ND	ND	1.091	0.053
HG	0.0001	0.0002	ND	ND	2.91E-07	6.41E-08	0.00002	ND	5.85E-07	ND	0.0001	ND	0.00001	0.0001	0.0001	ND
HMX	0.001	0.005	ND	ND	ND	ND	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.013	ND	ND	ND	ND	0.00001	ND	0.006	ND	ND	0.001	ND	ND	ND	ND	ND
NB	0.001	0.010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.001	0.001	ND	ND	ND	1.99E-06	0.0001	0.0003	0.00001	ND	0.0003	ND	ND	0.0001	0.0003	0.00001
NNDPA	3.85E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.003	ND	ND	ND	ND	1.12E-06	ND	ND	ND	ND	0.051	0.001	0.00001	0.0001	0.045	0.00001
PB	0.023	3.254	0.0001	ND	0.00001	0.0002	0.079	0.008	0.029	ND	0.046	0.005	0.001	0.003	0.041	0.001
PCB_S	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
PHENOL	1.53E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.0001	ND	ND	ND	1.73E-08	9.65E-08	ND	ND	ND	ND	0.0001	ND	0.00001	0.00001	0.00001	1.36E-06
RDX	0.011	1.543	ND	ND	ND	ND	ND	ND	ND	0.014	0.010	ND	ND	ND	ND	0.001
SB	0.003	0.062	ND	ND	ND	0.00001	ND	ND	0.001	ND	0.008	ND	ND	ND	0.017	ND
SE	0.004	ND	ND	ND	2.54E-06	ND	ND	ND	ND	ND	0.007	ND	ND	0.001	0.002	ND
TL	0.607	0.263	ND	ND	ND	0.0004	ND	ND	ND	ND	ND	ND	ND	0.006	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00002	ND	ND	ND	ND	ND
V	0.014	ND	ND	ND	ND	ND	0.002	0.006	0.0002	ND	ND	ND	ND	ND	0.008	ND
ZN	0.004	0.737	ND	ND	3.34E-06	0.00002	0.001	0.004	0.00004	ND	0.003	ND	ND	0.002	0.007	0.003
HI[d]_TOTAL	**3.5**	**16.7**	**0.00**	**0.00**	**0.00**	**0.00**	**0.4**	**1.0**	**0.1**	**0.03**	**0.5**	**0.01**	**0.00**	**0.02**	**1.3**	**0.1**

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Table 7-49. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Mule Deer (TEAD Historic Data) (continued)

Group	RSA	SWMU 20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.007	ND	0.014	0.006	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.00002	ND	1.69E-07	5.53E-09	6.44E-08	2.33E-06	4.50E-06	ND	ND	ND	ND	ND	ND	0.0001	ND	ND
AL	0.480	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.093	ND	ND	ND	ND	1.46E-07
AS	0.008	0.0001	0.00001	4.14E-06	0.0001	0.0002	0.001	0.00005	0.0002	0.001	0.001	ND	3.56E-06	2.97E-06	0.005	0.0001
A_D	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.20E-07	ND	ND
BA	0.024	0.003	0.001	ND	0.001	0.001	ND	ND	ND	ND	0.006	ND	ND	ND	ND	0.0004
BE	0.0001	ND	6.23E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.00001	ND	ND	ND	4.46E-08	ND	ND	ND	ND	ND	ND	ND	5.96E-09	ND	ND	ND
CD	0.001	0.0003	0.0003	ND	0.00003	0.00004	0.001	0.0001	0.0001	0.0001	0.001	ND	1.22E-06	7.41E-07	0.0001	ND
CLDN	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0003	ND
CO	0.083	ND	0.0001	0.00002	0.0002	0.001	ND	ND	ND	ND	0.008	ND	ND	ND	0.009	0.0004
CR_CRHEX	0.002	0.0001	0.0001	8.00E-07	0.00005	0.0001	0.002	0.0001	0.00003	0.001	0.002	ND	1.49E-06	8.19E-07	ND	0.00002
CU	0.008	0.005	0.002	1.99E-06	0.0002	0.0005	0.019	0.0001	0.0001	ND	0.002	ND	2.86E-06	4.33E-06	0.001	0.001
DCB	0.00004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	2.41E-06	ND	ND	ND	ND	ND	ND	ND	ND	0.00001	ND	ND	ND	2.56E-06	0.00001	ND
DIOXIN_FURAN	0.270	ND	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	0.015	ND	0.00001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.00001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.12E-07	0.0001	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	1.930	0.047	0.005	0.001	0.014	0.116	ND	ND	ND	ND	0.326	ND	ND	ND	0.285	0.024
HG	0.0001	1.84E-06	9.21E-08	ND	5.91E-07	0.00002	0.00001	0.00005	ND	ND	0.00002	ND	ND	ND	ND	ND
HMX	0.001	ND	ND	1.43E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.013	ND	0.00002	ND	ND	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.001	0.0001	0.00001	4.56E-07	3.29E-06	0.00001	0.0002	0.00001	ND	ND	0.0001	ND	ND	3.92E-07	ND	ND
NNDPA	3.85E-07	ND	1.10E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.003	0.00002	2.94E-07	ND	0.00004	ND	0.0004	ND	ND	0.0001	ND	0.00002	1.11E-08	ND	ND	ND
PB	0.023	0.028	0.010	0.000	0.001	0.009	0.037	0.001	0.001	0.004	0.016	0.0003	0.00001	0.00004	0.005	0.003
PCB_S	0.001	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	1.53E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.0001	2.49E-06	5.92E-08	ND	1.28E-07	ND	ND	ND	5.90E-07	ND	ND	3.49E-07	ND	ND	ND	ND
RDX	0.011	ND	0.00002	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	0.003	0.002	0.001	ND	ND	0.001	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.004	ND	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.27E-06	ND	ND
TL	0.607	0.006	0.001	ND	ND	ND	0.023	0.002	0.004	ND	ND	ND	ND	0.0001	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	0.0003	ND	ND	ND	ND	ND	ND
V	0.014	ND	ND	ND	ND	0.001	ND	ND	ND	ND	0.003	ND	ND	ND	ND	ND
ZN	0.004	0.001	0.0005	3.44E-06	0.0002	0.0002	0.017	0.0001	ND	0.001	0.002	ND	ND	0.00001	0.001	0.0001
HI_TOTAL	**3.5**	**0.1**	**0.04**	**0.01**	**0.02**	**0.1**	**0.1**	**0.00**	**0.01**	**0.01**	**0.5**	**0.00**	**0.00**	**0.00**	**0.3**	**0.03**

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Table 7-49. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Mule Deer (TEAD Historic Data) (continued)

		SWMU							
Group	RSA	37	38	40	42	45	46	47
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.007	0.00001	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.00002	ND	ND	2.53E-06	0.0001	1.06E-06	ND	ND
AL	0.480	ND	ND	ND	ND	ND	ND	ND
AS	0.008	ND	ND	0.002	0.004	0.001	2.96E-06	ND
A_D	0.0001	ND	ND	ND	ND	0.004	ND	ND
BA	0.024	ND	ND	0.010	0.381	0.001	ND	ND
BE	0.0001	ND	ND	ND	0.00001	ND	ND	ND
BZALC	0.00001	ND	ND	ND	ND	ND	ND	ND
CD	0.001	3.42E-06	1.09E-06	0.0002	0.003	0.0002	1.66E-06	ND
CLDN	0.0001	ND	ND	ND	ND	0.002	ND	ND
CO	0.083	ND	ND	0.009	0.015	0.002	ND	ND
CR_CRHEX	0.002	ND	ND	0.0004	0.003	0.0002	3.19E-06	ND
CU	0.008	ND	0.00001	0.002	0.252	0.001	0.00001	ND
DCB	0.00004	ND	ND	ND	ND	ND	ND	ND
DDT_R	2.41E-06	ND	ND	ND	0.000	0.000	ND	ND
DIOXIN_FURAN	0.270	0.013	ND	ND	0.278	0.000	ND	ND
DN_TOL	0.015	ND	ND	ND	0.009	0.001	ND	ND
E_I	0.00001	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND
FE	1.930	ND	ND	0.357	0.590	0.0005	0.002	ND
HG	0.0001	ND	1.16E-07	0.00001	0.00003	0.00001	1.93E-07	1.35E-06
HMX	0.001	ND	ND	0.002	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.013	ND	ND	ND	0.003	0.0001	ND	ND
NB	0.001	ND	ND	ND	ND	ND	ND	ND
NI	0.001	ND	ND	0.0001	0.001	0.00004	7.33E-07	ND
NNDPA	3.85E-07	ND	ND	ND	ND	ND	ND	ND
PAH	0.003	0.00003	9.12E-07	ND	0.0003	0.0002	ND	ND
PB	0.023	0.0001	0.00002	0.016	1.770	0.007	0.0001	0.001
PCB_S	0.001	ND	ND	ND	ND	ND	ND	ND
PHENOL	1.53E-06	ND	2.66E-08	ND	ND	ND	ND	ND
PHTLAT	0.0001	3.76E-08	4.45E-09	ND	3.70E-06	0.00004	ND	ND
RDX	0.011	ND	ND	0.379	ND	ND	ND	ND
SB	0.003	ND	ND	ND	0.351	ND	0.00001	0.0002
SE	0.004	ND	ND	ND	ND	ND	ND	ND
TL	0.607	ND	0.0003	ND	0.153	0.015	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	0.00002	0.001
V	0.014	ND	ND	0.004	ND	0.001	ND	ND
ZN	0.004	0.0001	ND	0.001	0.018	0.001	0.00001	ND
HI_TOTAL	**3.5**	**0.01**	**0.00**	**0.8**	**3.8**	**0.04**	**0.00**	**0.00**

[a]Solid Waste Management Unit
[b]Reference Study Area
[c]No Data or Pathway Incomplete
[d]Hazard Index

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Table 7-50. Final Hazard Indices for All Exposure Pathways for the Mule Deer (TEAD Current Data)

		SWMU[a]									
GROUP	RSA[b]	1b	1c	10	11	12	15	21	37	42	45
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	2.188	0.004	0.173	0.044	0.139	0.038	0.437	0.002	0.004	0.189	0.036
24D	0.289	0.000	0.016	0.002	0.002	0.009	0.036	0.000	0.001	0.026	0.005
AG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AL	0.784	0.003	0.095	0.006	0.008	0.025	0.153	0.001	0.002	0.096	0.024
AS	0.021	0.000	0.004	0.000	0.001	0.002	0.022	0.000	0.000	0.010	0.002
A_D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BA	0.218	0.001	0.021	0.001	0.003	0.009	0.043	0.001	0.001	0.435	0.007
BE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BZALC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CD	0.023	0.000	0.006	0.000	0.000	0.001	0.045	0.000	0.000	0.006	0.002
CLDN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CO	0.137	0.000	0.014	0.001	0.001	0.005	0.066	0.000	0.000	0.045	0.003
CR_CRHEX	0.005	0.000	0.001	0.000	0.000	0.000	0.003	0.000	0.000	0.001	0.000
CU	0.160	0.000	0.013	0.002	0.005	0.010	0.473	0.001	0.001	0.043	0.004
DCB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DDT_R	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DIOXIN_FURAN	1.415	0.005	0.178	0.007	0.019	0.024	0.552	0.009	0.063	0.189	0.025
DN_TOL	0.015	0.000	0.001	0.000	0.002	0.001	0.004	0.000	0.000	0.009	0.001
E_I	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	2.905	0.009	0.387	0.025	0.186	0.112	1.856	0.002	0.009	0.376	0.095
HG	0.002	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
HMX	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.087	0.000	0.012	0.001	0.001	0.003	0.011	0.000	0.000	0.011	0.002
NB	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NI	0.008	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.002	0.000
NNDPA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PAH	0.004	0.000	0.000	0.000	0.051	0.001	0.515	0.000	0.000	0.002	0.004
PB	0.075	0.000	0.005	0.001	0.022	0.009	0.071	0.003	0.000	0.337	0.011
PCB_S	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PHENOL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PHTLAT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RDX	3.349	0.012	0.480	4.725	0.079	0.221	0.779	0.003	0.011	0.569	0.123
SB	0.093	0.000	0.006	0.001	0.004	0.009	0.036	0.001	0.000	0.249	0.002
SE	0.276	0.001	0.023	0.002	0.010	0.017	0.062	0.000	0.001	0.044	0.010
TL	0.607	0.002	0.061	0.006	0.009	0.046	0.152	0.000	0.002	0.109	0.015
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	0.022	0.000	0.003	0.000	0.000	0.001	0.005	0.000	0.000	0.004	0.001
ZN	0.059	0.001	0.010	0.001	0.004	0.007	0.102	0.000	0.000	0.015	0.003
HI[d] TOTAL	12.7	0.0	1.5	4.8	0.5	0.6	5.4	0.02	0.1	2.8	0.4

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-51. Final Hazard Indices for All Exposure Pathways for the Mule Deer (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	2.188	0.254	0.958
24D	0.289	0.035	0.072
AG	0.000	0.000	0.000
AL	0.784	0.147	0.346
AS	0.021	0.011	0.019
A_D	0.000	0.001	0.000
BA	0.218	0.378	0.160
BE	0.000	0.000	0.000
BZALC	0.000	0.000	0.000
CD	0.023	0.014	0.045
CLDN	0.000	0.000	0.000
CO	0.137	0.043	0.064
CR_CRHEX	0.005	0.002	0.004
CU	0.160	0.044	0.265
DCB	0.000	0.000	0.000
DDT_R	0.001	0.000	0.000
DIOXIN_FURAN	1.415	0.246	3.813
DN_TOL	0.015	0.008	0.011
E_I	0.000	0.000	0.000
ENDOSULFAN	ND	ND	ND
FE	2.905	0.579	2.145
HG	0.002	0.000	0.001
HMX	0.001	0.000	0.000
H_HE	ND	ND	ND
LIN	ND	ND	ND
MN	0.087	0.014	0.028
NB	0.001	0.000	0.001
NI	0.008	0.001	0.004
NNDPA	0.000	0.000	0.000
PAH	0.004	0.033	0.227
PB	0.075	0.296	0.467
PCB_S	0.001	0.001	0.000
PHENOL	0.000	0.000	0.000
PHTLAT	0.000	0.001	0.000
RDX	3.349	0.783	22.804
SB	0.093	0.184	0.094
SE	0.276	0.078	0.118
TL	0.607	0.124	0.277
TPHC	ND	ND	ND
V	0.022	0.005	0.011
ZN	0.059	0.021	0.095
HI[d] TOTAL	12.7	3.3	32.0

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-52. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Jackrabbit (TEAD Historic Data)

Group	RSA[a]	SWMU[a] 01	1b	1c	03	04	06	07	08	10	11	12	13	14	15	19
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.020	12.103	ND	ND	ND	ND	ND	ND	ND	0.220	0.526	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.0001	0.0005	ND	ND	0.00004	ND	0.00002	ND	1.76E-06	ND	0.00001	ND	ND	0.001	0.0003	ND
AL	1.064	2.497	ND	ND	ND	ND	ND	2.073	ND	ND	0.005	ND	ND	ND	ND	ND
AS	0.022	ND	ND	ND	ND	0.00004	0.026	0.052	0.001	ND	0.003	0.009	ND	0.003	0.069	ND
A_D	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	0.0001	ND	ND	0.007	ND
BA	0.067	0.598	ND	ND	ND	0.0002	0.053	0.116	0.004	ND	0.010	ND	ND	0.017	0.165	ND
BE	0.000	0.000	ND	ND	ND	4.03E-07	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.000	ND	ND	ND	ND	6.44E-08	ND	ND	ND	ND	ND	ND	ND	0.00002	ND	ND
CD	0.002	0.051	0.0002	ND	0.00001	0.0002	0.002	0.003	ND	ND	0.003	ND	ND	0.009	0.017	0.0004
CLDN	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND	ND
CO	0.230	0.182	ND	ND	0.0003	0.001	0.067	0.211	0.007	ND	0.010	ND	ND	ND	0.299	ND
CR_CRHEX	0.006	0.009	ND	ND	0.0001	0.0002	0.003	0.008	0.0003	ND	0.002	ND	0.002	0.004	0.113	0.0003
CU	0.022	6.628	ND	ND	0.0001	0.0002	0.021	0.016	0.006	ND	0.389	ND	ND	0.029	0.412	0.021
DCB	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	0.0004	ND	ND	ND
DDT_R	0.00001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	ND
DIOXIN_FURA	0.747	ND	0.000	0.000	ND	ND	ND	ND	ND	0.006	0.0004	ND	ND	ND	0.284	ND
DN_TOL	0.041	0.066	ND	ND	ND	ND	0.034	ND	ND	ND	0.010	ND	ND	ND	ND	ND
E_I	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00002	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	5.347	11.648	ND	ND	ND	0.029	2.872	7.826	0.262	ND	1.770	ND	ND	ND	11.739	0.569
HG	0.0003	0.001	ND	ND	3.13E-06	6.89E-07	0.0002	ND	0.00001	ND	0.001	ND	0.0001	0.001	0.001	ND
HMX	0.002	0.017	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.036	ND	ND	ND	ND	0.0001	ND	0.063	ND	ND	0.009	ND	ND	ND	ND	ND
NB	0.004	0.032	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.003	0.004	ND	ND	ND	0.00002	0.001	0.003	0.0001	ND	0.002	ND	ND	0.001	0.003	0.0001
NNDPA	1.07E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.010	ND	ND	ND	ND	0.00001	ND	ND	ND	ND	0.235	0.010	0.0001	0.001	0.486	0.0001
PB	0.065	10.306	0.001	ND	0.0001	0.002	0.847	0.086	0.310	ND	0.487	0.051	0.008	0.033	0.438	0.014
PCB_S	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.002	ND
PHENOL	4.25E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.0003	ND	ND	ND	1.86E-07	1.04E-06	ND	ND	ND	ND	0.0003	ND	0.0002	0.0001	0.0001	0.00001
RDX	0.031	4.886	ND	ND	ND	ND	ND	ND	ND	0.148	0.048	ND	ND	ND	ND	0.006
SB	0.008	0.197	ND	ND	ND	0.0001	ND	ND	0.011	ND	0.079	ND	ND	ND	0.181	ND
SE	0.011	ND	ND	ND	0.00003	ND	ND	ND	ND	ND	0.031	ND	ND	0.007	0.017	ND
TL	1.683	0.832	ND	ND	ND	0.004	ND	ND	ND	ND	ND	ND	ND	0.062	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	ND	ND	ND	ND	ND
V	0.050	ND	ND	ND	ND	ND	0.028	0.083	0.003	ND	ND	ND	ND	ND	0.105	ND
ZN	0.014	2.917	ND	ND	0.00004	0.0003	0.019	0.060	0.001	ND	0.025	ND	ND	0.021	0.097	0.043
HI[d]_TOTAL	**9.5**	**53.0**	**0.00**	**0.00**	**0.00**	**0.04**	**4.0**	**10.6**	**0.6**	**0.4**	**3.6**	**0.1**	**0.01**	**0.2**	**14.4**	**0.7**

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Table 7-52. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Jackrabbit (TEAD Historic Data) (continued)*

Group	RSA	SWMU														
		20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.020	ND	0.151	0.062	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND
AG	0.0001	ND	2.27E-06	7.44E-08	8.66E-07	0.00003	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	1.97E-06
AL	1.064	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.801	ND	ND	ND	ND	ND
AS	0.022	0.001	0.0001	0.00004	0.001	0.002	0.012	0.001	0.002	0.012	0.010	ND	0.00004	0.00003	0.051	0.001
A_D	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.37E-06	ND	ND
BA	0.067	0.035	0.009	ND	0.004	0.006	ND	ND	ND	ND	0.065	ND	ND	ND	ND	0.005
BE	0.0001	ND	6.70E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.00001	ND	ND	ND	1.92E-07	ND	ND	ND	ND	ND	ND	ND	2.57E-08	ND	ND	ND
CD	0.002	0.003	0.003	ND	0.000	0.000	0.009	0.001	0.001	0.001	0.011	ND	0.00001	0.00001	0.001	ND
CLDN	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.003	ND
CO	0.230	ND	0.001	0.0002	0.002	0.008	ND	ND	ND	ND	0.086	ND	ND	ND	0.098	0.004
CR_CRHEX	0.006	0.001	0.002	0.00001	0.0005	0.001	0.017	0.002	0.0004	0.006	0.021	ND	0.00002	0.00001	ND	0.0002
CU	0.022	0.052	0.025	0.00002	0.001	0.005	0.203	0.001	0.001	ND	0.017	ND	0.00003	0.00005	0.008	0.009
DCB	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.00001	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	ND	ND	ND	0.00003	0.0001	ND
DIOXIN_FURA	0.747	ND	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	0.041	ND	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.36E-06	0.001	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	5.347	0.503	0.058	0.008	0.124	1.252	ND	ND	ND	ND	3.506	ND	ND	ND	3.066	0.260
HG	0.0003	0.00002	9.91E-07	ND	0.00001	0.0002	0.0001	0.0005	ND	ND	0.0002	ND	ND	ND	ND	ND
HMX	0.002	ND	ND	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.036	ND	0.0003	ND	ND	0.003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.003	0.001	0.0001	4.91E-06	0.00004	0.0001	0.002	0.0001	ND	ND	0.002	ND	ND	4.22E-06	ND	ND
NNDPA	1.07E-06	ND	1.18E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.010	0.0002	3.17E-06	ND	0.0004	ND	0.004	ND	ND	0.001	ND	0.0002	1.19E-07	ND	ND	ND
PB	0.065	0.297	0.108	0.0001	0.006	0.098	0.396	0.014	0.008	0.039	0.167	0.003	0.0002	0.0005	0.051	0.028
PCB_S	0.002	ND	ND	ND	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	4.25E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.0003	0.00003	6.37E-07	ND	1.38E-06	ND	ND	ND	0.00001	ND	ND	3.75E-06	ND	ND	ND	ND
RDX	0.031	ND	0.0002	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	0.008	0.022	0.009	ND	ND	0.007	0.047	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.011	ND	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00001	ND	ND
TL	1.683	0.065	0.009	ND	ND	ND	0.251	0.017	0.045	ND	ND	ND	ND	0.001	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	0.001	0.003	ND	ND	ND	ND	ND	ND
V	0.050	ND	ND	ND	ND	0.010	ND	ND	ND	ND	0.037	ND	ND	ND	ND	ND
ZN	0.014	0.017	0.007	0.00005	0.002	0.002	0.226	0.002	ND	0.016	0.025	ND	ND	0.0001	0.010	0.002
HI_TOTAL	**9.5**	**1.0**	**0.4**	**0.1**	**0.1**	**1.4**	**1.2**	**0.04**	**0.1**	**0.1**	**4.7**	**0.00**	**0.00**	**0.00**	**3.3**	**0.3**

Table 7-52. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Jackrabbit (TEAD Historic Data) (continued)

Group	RSA	SWMU 37	38	40	42	45	46	47
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.020	0.0001	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.0001	ND	ND	0.00003	0.001	0.00001	ND	ND
AL	1.064	ND	ND	ND	ND	ND	ND	ND
AS	0.022	ND	ND	0.025	0.040	0.013	0.00003	ND
A_D	0.0003	ND	ND	ND	ND	0.042	ND	ND
BA	0.067	ND	ND	0.105	4.100	0.004	ND	ND
BE	0.0001	ND	ND	ND	0.0001	ND	ND	ND
BZALC	0.00001	ND	ND	ND	ND	ND	ND	ND
CD	0.002	0.00004	0.00001	0.002	0.029	0.002	0.00002	ND
CLDN	0.0003	ND	ND	ND	ND	0.017	ND	ND
CO	0.230	ND	ND	0.093	0.161	0.019	ND	ND
CR_CRHEX	0.006	ND	ND	0.004	0.031	0.002	0.00003	ND
CU	0.022	ND	0.0001	0.026	2.715	0.011	0.0001	ND
DCB	0.0001	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.00001	ND	ND	ND	0.002	0.001	ND	ND
DIOXIN_FURA	0.747	0.135	ND	ND	2.997	0.003	ND	ND
DN_TOL	0.041	ND	ND	ND	0.099	0.004	ND	ND
E_I	0.00002	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND
FE	5.347	ND	ND	3.840	6.345	0.002	0.017	ND
HG	0.0003	ND	1.24E-06	0.0001	0.0003	0.0001	2.08E-06	0.00001
HMX	0.002	ND	ND	0.022	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.036	ND	ND	ND	0.029	0.0004	ND	ND
NB	0.004	ND	ND	ND	ND	ND	ND	ND
NI	0.003	ND	ND	0.001	0.009	0.0005	0.00001	ND
NNDPA	1.07E-06	ND	ND	ND	ND	ND	ND	ND
PAH	0.010	0.0004	0.00001	ND	0.004	0.002	ND	ND
PB	0.065	0.001	0.0003	0.171	19.054	0.079	0.001	0.011
PCB_S	0.002	ND	ND	ND	ND	ND	ND	ND
PHENOL	4.25E-06	ND	2.86E-07	ND	ND	ND	ND	ND
PHTLAT	0.0003	4.05E-07	4.79E-08	ND	0.00004	0.0003	ND	ND
RDX	0.031	ND	ND	4.084	ND	ND	ND	ND
SB	0.008	ND	ND	ND	3.782	ND	0.0001	0.002
SE	0.011	ND	ND	ND	ND	ND	ND	ND
TL	1.683	ND	0.003	ND	1.651	0.158	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	0.0002	0.011
V	0.050	ND	ND	0.051	ND	0.010	ND	ND
ZN	0.014	0.002	ND	0.014	0.248	0.010	0.0001	ND
HI_TOTAL	**9.5**	**0.1**	**0.00**	**8.4**	**41.3**	**0.4**	**0.02**	**0.02**

[a]Solid Waste Management Unit
[b]Reference Study Area
[c]No Data or Pathway Incomplete
[d]Hazard Index

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Table 7-53. Final Hazard Indices for All Exposure Pathways for the Jackrabbit (TEAD Current Data)

		SWMU[a]									
GROUP	**RSA[b]**	**1b**	**1c**	**10**	**11**	**12**	**15**	**21**	**37**	**42**	**45**
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	6.126	0.047	1.882	0.476	0.802	0.415	4.748	0.021	0.043	2.060	0.394
24D	0.810	0.004	0.176	0.018	0.026	0.100	0.396	0.001	0.006	0.285	0.058
AG	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
AL	1.743	0.022	0.823	0.052	0.059	0.217	1.318	0.006	0.017	0.827	0.207
AS	0.058	0.000	0.043	0.002	0.005	0.025	0.241	0.000	0.001	0.108	0.016
A_D	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.003
BA	0.609	0.007	0.223	0.015	0.032	0.102	0.470	0.009	0.008	4.728	0.068
BE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BZALC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CD	0.065	0.004	0.062	0.001	0.002	0.006	0.490	0.003	0.001	0.070	0.019
CLDN	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001
CO	0.381	0.003	0.150	0.008	0.008	0.056	0.714	0.001	0.004	0.485	0.037
CR_CRHEX	0.014	0.000	0.006	0.000	0.002	0.003	0.031	0.000	0.000	0.013	0.004
CU	0.447	0.005	0.145	0.022	0.046	0.108	5.091	0.006	0.006	0.471	0.045
DCB	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
DDT_R	0.004	0.000	0.003	0.000	0.001	0.001	0.006	0.000	0.000	0.003	0.000
DIOXIN_FURAN	3.954	0.057	1.940	0.073	0.202	0.264	6.003	0.094	0.683	2.058	0.269
DN_TOL	0.041	0.000	0.016	0.002	0.012	0.012	0.040	0.000	0.001	0.095	0.008
E_I	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	8.079	0.093	4.175	0.266	1.720	1.204	19.991	0.024	0.098	4.069	1.017
HG	0.005	0.000	0.001	0.000	0.001	0.001	0.009	0.000	0.000	0.004	0.001
HMX	0.002	0.000	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.000
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.243	0.003	0.134	0.007	0.011	0.032	0.123	0.000	0.002	0.116	0.021
NB	0.004	0.000	0.001	0.000	0.000	0.001	0.004	0.000	0.000	0.003	0.000
NI	0.022	0.000	0.009	0.000	0.002	0.005	0.015	0.000	0.000	0.017	0.001
NNDPA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PAH	0.011	0.000	0.004	0.000	0.236	0.013	5.544	0.000	0.001	0.017	0.045
PB	0.210	0.002	0.049	0.007	0.228	0.098	0.771	0.037	0.002	3.656	0.115
PCB_S	0.002	0.000	0.001	0.000	0.000	0.001	0.002	0.000	0.000	0.001	0.002
PHENOL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PHTLAT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
RDX	9.376	0.131	5.221	51.380	0.796	2.400	8.475	0.033	0.119	6.190	1.339
SB	0.261	0.002	0.070	0.007	0.034	0.094	0.388	0.006	0.003	2.685	0.026
SE	0.772	0.006	0.245	0.024	0.066	0.189	0.677	0.002	0.009	0.479	0.110
TL	1.683	0.016	0.654	0.065	0.098	0.490	1.634	0.004	0.023	1.176	0.163
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	0.076	0.001	0.037	0.003	0.002	0.015	0.067	0.000	0.001	0.051	0.010
ZN	0.206	0.008	0.141	0.013	0.040	0.093	1.379	0.003	0.005	0.197	0.037
HI[d] TOTAL	**35.2**	**0.4**	**16.2**	**52.4**	**4.4**	**5.9**	**58.6**	**0.3**	**1.0**	**29.9**	**4.0**

[a]Solid waste management unit.

[b]reference study area.

[c]No data or pathway incomplete.

[d]Hazard index.

Table 7-54. Final Hazard Indices for All Exposure Pathways for the Jackrabbit (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	6.13	2.76	5.70
24D	0.81	0.38	0.44
AG	0.00	0.00	0.00
AL	1.74	1.27	1.69
AS	0.06	0.12	0.11
A_D	0.00	0.01	0.00
BA	0.61	4.10	0.98
BE	0.00	0.00	0.00
BZALC	0.00	0.00	0.00
CD	0.07	0.15	0.28
CLDN	0.00	0.00	0.00
CO	0.38	0.47	0.39
CR_CRHEX	0.01	0.02	0.02
CU	0.45	0.48	1.61
DCB	0.00	0.00	0.00
DDT_R	0.00	0.00	0.00
DIOXIN_FURAN	3.95	2.67	23.38
DN_TOL	0.04	0.08	0.06
E_I	0.00	0.00	0.00
ENDOSULFAN	ND	ND	ND
FE	8.08	6.25	12.98
HG	0.00	0.00	0.01
HMX	0.00	0.00	0.00
H_HE	ND	ND	ND
LIN	ND	ND	ND
MN	0.24	0.15	0.17
NB	0.00	0.00	0.00
NI	0.02	0.02	0.03
NNDPA	0.00	0.00	0.00
PAH	0.01	0.36	1.31
PB	0.21	3.21	2.85
PCB_S	0.00	0.01	0.00
PHENOL	0.00	0.00	0.00
PHTLAT	0.00	0.01	0.00
RDX	9.38	8.51	139.81
SB	0.26	1.99	0.57
SE	0.77	0.85	0.72
TL	1.68	1.34	1.68
TPHC	ND	ND	ND
V	0.08	0.07	0.08
ZN	0.21	0.29	0.73
HI[d] TOTAL	35.2	35.6	195.6

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-55. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Kit Fox (TEAD Historic Data)*

Group	RSA[b]	SWMU[a]														
		01	1b	1c	03	04	06	07	08	10	11	12	13	14	15	19
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.055	2.444	ND	ND	ND	ND	ND	ND	ND	0.013	0.190	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.0003	0.0002	ND	ND	3.54E-06	ND	2.06E-06	ND	1.68E-07	ND	7.54E-07	ND	ND	0.0001	0.00003	ND
AL	5.992	1.008	ND	ND	ND	ND	ND	0.246	ND	ND	0.003	ND	ND	ND	ND	ND
AS	0.099	ND	ND	ND	ND	4.10E-06	0.002	0.005	0.0001	ND	0.001	0.001	ND	0.0003	0.007	ND
A_D	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00003	0.00001	ND	ND	0.0003	ND
BA	0.301	0.193	ND	ND	ND	0.00002	0.005	0.011	0.0004	ND	0.003	ND	ND	0.002	0.016	ND
BE	0.001	0.0001	ND	ND	ND	3.84E-08	ND	0.00001	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.0001	ND	ND	ND	ND	1.53E-08	ND	ND	ND	ND	ND	ND	ND	4.07E-06	ND	ND
CD	0.011	0.017	0.00002	ND	4.83E-07	0.00002	0.0002	0.0003	ND	ND	0.0003	ND	ND	0.001	0.002	0.00004
CLDN	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	ND	ND	ND	ND
CO	1.294	0.073	ND	ND	0.00003	0.0002	0.008	0.025	0.001	ND	0.001	ND	ND	ND	0.035	ND
CR_CRHEX	0.022	0.002	ND	ND	0.00001	0.00002	0.0002	0.001	0.00002	ND	0.0005	ND	0.0001	0.0003	0.009	0.00002
CU	0.078	1.716	ND	ND	0.00001	0.00001	0.002	0.001	0.0005	ND	0.033	ND	ND	0.002	0.031	0.002
DCB	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	0.00004	ND	ND	ND
DDT_R	0.00003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00001	ND
DIOXIN_FURAN	3.368	ND	1.84E-06	0.00004	ND	ND	ND	ND	ND	0.001	0.00004	ND	ND	ND	0.027	ND
DN_TOL	0.111	0.013	ND	ND	ND	ND	0.002	ND	ND	ND	0.003	ND	ND	ND	ND	ND
E_I	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.86E-06	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	24.046	3.754	ND	ND	ND	0.003	0.272	0.742	0.025	ND	0.269	ND	ND	ND	1.113	0.054
HG	0.001	0.0002	ND	ND	2.98E-07	6.56E-08	0.00002	ND	5.98E-07	ND	0.0002	ND	0.00001	0.0001	0.0001	ND
HMX	0.007	0.005	ND	ND	ND	ND	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.160	ND	ND	ND	ND	0.00001	ND	0.006	ND	ND	0.002	ND	ND	ND	ND	ND
NB	0.017	0.010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.014	0.001	ND	ND	ND	2.03E-06	0.0001	0.0003	0.00001	ND	0.001	ND	ND	0.0001	0.0003	0.00001
NNDPA	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.044	ND	ND	ND	ND	1.16E-06	ND	ND	ND	ND	0.138	0.001	0.00001	0.0001	0.047	0.00001
PB	0.291	3.330	0.0001	ND	0.00001	0.0002	0.081	0.008	0.030	ND	0.049	0.005	0.001	0.003	0.042	0.001
PCB_S	0.007	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
PHENOL	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.001	ND	ND	ND	1.77E-08	9.87E-08	ND	ND	ND	ND	0.0001	ND	0.00002	0.00001	0.00001	1.39E-06
RDX	0.142	1.579	ND	ND	ND	ND	ND	ND	ND	0.014	0.028	ND	ND	ND	ND	0.001
SB	0.037	0.064	ND	ND	ND	0.00001	ND	ND	0.001	ND	0.012	ND	ND	ND	0.017	ND
SE	0.050	ND	ND	ND	2.60E-06	ND	ND	ND	ND	ND	0.017	ND	ND	0.001	0.002	ND
TL	7.587	0.269	ND	ND	ND	0.0004	ND	ND	ND	ND	ND	ND	ND	0.006	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00001	ND	ND	ND	ND	ND
V	0.220	ND	ND	ND	ND	ND	0.003	0.008	0.0002	ND	ND	ND	ND	ND	0.010	ND
ZN	0.063	0.943	ND	ND	4.28E-06	0.00003	0.002	0.006	0.0001	ND	0.008	ND	ND	0.002	0.009	0.004
HI[d]_TOTAL	**44.0**	**15.4**	**0.00**	**0.00**	**0.00**	**0.00**	**0.4**	**1.1**	**0.1**	**0.03**	**0.8**	**0.01**	**0.00**	**0.02**	**1.4**	**0.1**

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Table 7-55. Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Kit Fox (TEAD Historic Data) (continued)

		SWMU														
Group	RSA	20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.055	ND	0.009	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00003	ND	ND
AG	0.0003	ND	2.16E-07	7.08E-09	8.24E-08	2.98E-06	0.00001	ND	ND	ND	ND	ND	ND	ND	ND	1.87E-07
AL	5.992	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.095	ND	ND	ND	ND	ND
AS	0.099	0.0001	0.00001	4.24E-06	0.0001	0.0002	0.001	0.00005	0.0002	0.001	0.001	ND	3.65E-06	3.04E-06	0.005	0.0001
A_D	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.13E-07	ND	ND
BA	0.301	0.003	0.002	ND	0.002	0.001	ND	ND	ND	ND	0.006	ND	ND	ND	ND	0.0004
BE	0.001	ND	6.37E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	0.000	ND	ND	ND	4.56E-08	ND	ND	ND	ND	ND	ND	ND	6.10E-09	ND	ND	ND
CD	0.011	0.0003	0.0003	ND	0.00003	0.00004	0.001	0.0001	0.0001	0.0001	0.001	ND	1.25E-06	7.58E-07	0.0001	ND
CLDN	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0003	ND
CO	1.294	ND	0.0001	0.00002	0.0003	0.001	ND	ND	ND	ND	0.010	ND	ND	ND	0.012	0.0005
CR_CRHEX	0.022	0.0001	0.0001	6.55E-07	0.00004	0.0001	0.001	0.0001	0.00003	0.0005	0.002	ND	1.22E-06	6.71E-07	ND	0.00002
CU	0.078	0.004	0.002	1.63E-06	0.0004	0.0004	0.015	0.00005	0.0001	ND	0.001	ND	2.35E-06	3.55E-06	0.001	0.001
DCB	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.00003	ND	ND	ND	ND	ND	ND	ND	ND	0.00001	ND	ND	ND	2.62E-06	0.00001	ND
DIOXIN_FURAN	3.368	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	0.111	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.19E-07	0.0001	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	24.046	0.048	0.006	0.001	0.021	0.119	ND	ND	ND	ND	0.333	ND	ND	ND	0.291	0.025
HG	0.001	1.89E-06	9.42E-08	ND	6.05E-07	0.00002	0.00001	0.00005	ND	ND	0.00002	ND	ND	ND	ND	ND
HMX	0.007	ND	ND	0.000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.160	ND	0.000	ND	ND	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	0.017	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.014	0.0001	0.00001	4.67E-07	3.37E-06	0.00001	0.0002	0.00001	ND	ND	0.0002	ND	ND	4.01E-07	ND	ND
NNDPA	4.81E-06	ND	1.13E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.044	0.000	3.06E-07	ND	0.00004	ND	0.0004	ND	ND	0.0001	ND	0.00002	1.15E-08	ND	ND	ND
PB	0.291	0.028	0.010	0.00001	0.001	0.009	0.038	0.001	0.001	0.004	0.016	0.0003	0.00001	0.00004	0.005	0.003
PCB_S	0.007	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.001	2.55E-06	6.06E-08	ND	1.31E-07	ND	ND	ND	6.04E-07	ND	ND	3.57E-07	ND	ND	ND	ND
RDX	0.142	ND	0.00002	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	0.037	0.002	0.001	ND	ND	0.001	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.050	ND	0.00002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.30E-06	ND	ND
TL	7.587	0.006	0.001	ND	ND	ND	0.024	0.002	0.004	ND	ND	ND	ND	0.0001	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	0.0002	ND	ND	ND	ND	ND	ND
V	0.220	ND	ND	ND	ND	0.001	ND	ND	ND	ND	0.003	ND	ND	ND	ND	ND
ZN	0.063	0.002	0.001	4.40E-06	0.0004	0.0002	0.021	0.0001	ND	0.002	0.002	ND	ND	0.00001	0.001	0.0002
HI_TOTAL	44.0	0.1	0.03	0.01	0.03	0.1	0.1	0.00	0.01	0.01	0.5	0.00	0.00	0.00	0.3	0.03

Table 7-55. *Final Hazard Indices for Soil & Surface Water Exposure Pathways for the Kit Fox (TEAD Historic Data) (continued)*

		SWMU						
Group	**RSA**	**37**	**38**	**40**	**42**	**45**	**46**	**47**
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.055	0.00001	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.0003	ND	ND	3.24E-06	0.0001	1.36E-06	ND	ND
AL	5.992	ND	ND	ND	ND	ND	ND	ND
AS	0.099	ND	ND	0.002	0.004	0.002	3.03E-06	ND
A_D	0.001	ND	ND	ND	ND	0.002	ND	ND
BA	0.301	ND	ND	0.010	0.388	0.002	ND	ND
BE	0.001	ND	ND	ND	0.000	ND	ND	ND
BZALC	0.0001	ND	ND	ND	ND	ND	ND	ND
CD	0.011	3.50E-06	1.12E-06	0.0002	0.003	0.0002	1.70E-06	ND
CLDN	0.001	ND	ND	ND	ND	0.002	ND	ND
CO	1.294	ND	ND	0.011	0.019	0.002	ND	ND
CR_CRHEX	0.022	ND	ND	0.0003	0.002	0.0002	2.62E-06	ND
CU	0.078	ND	0.00001	0.002	0.207	0.001	0.00001	ND
DCB	0.001	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.00003	ND	ND	ND	0.0002	0.0001	ND	ND
DIOXIN_FURAN	3.368	0.013	ND	ND	0.285	0.0003	ND	ND
DN_TOL	0.111	ND	ND	ND	0.006	0.002	ND	ND
E_I	0.0001	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND
FE	24.046	ND	ND	0.364	0.602	0.001	0.002	ND
HG	0.001	ND	1.18E-07	0.00001	0.00003	0.00001	1.97E-07	1.38E-06
HMX	0.007	ND	ND	0.002	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.160	ND	ND	ND	0.003	0.0002	ND	ND
NB	0.017	ND	ND	ND	ND	ND	ND	ND
NI	0.014	ND	ND	0.0001	0.001	0.00004	7.50E-07	ND
NNDPA	4.81E-06	ND	ND	ND	ND	ND	ND	ND
PAH	0.044	0.00004	9.48E-07	ND	0.0003	0.0002	ND	ND
PB	0.291	0.0001	0.00002	0.016	1.812	0.008	0.0001	0.001
PCB_S	0.007	ND	ND	ND	ND	ND	ND	ND
PHENOL	0.00002	ND	2.72E-08	ND	ND	ND	ND	ND
PHTLAT	0.001	3.85E-08	4.56E-09	ND	3.79E-06	0.0001	ND	ND
RDX	0.142	ND	ND	0.388	ND	ND	ND	ND
SB	0.037	ND	ND	ND	0.360	ND	0.00001	0.0002
SE	0.050	ND	ND	ND	ND	ND	ND	ND
TL	7.587	ND	0.0003	ND	0.157	0.015	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	0.00002	0.001
V	0.220	ND	ND	0.005	ND	0.001	ND	ND
ZN	0.063	0.0002	ND	0.001	0.024	0.001	0.00001	ND
HI_TOTAL	**44.0**	**0.01**	**0.00**	**0.8**	**3.9**	**0.04**	**0.00**	**0.00**

[a]Solid Waste Management Unit [c]No Data or Pathway Incomplete
[b]Reference Study Area [d]Hazard Index

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Table 7-56. Final Hazard Indices for All Exposure Pathways for the Kit Fox (TEAD Current Data)

		SWMU[a]									
GROUP	**RSA[b]**	**1b**	**1c**	**10**	**11**	**12**	**15**	**21**	**37**	**42**	**45**
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.074	0.000	0.001	0.000	0.190	0.000	0.002	0.000	0.000	0.001	0.000
24D	0.318	0.000	0.003	0.000	0.000	0.002	0.007	0.000	0.000	0.005	0.001
AG	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AL	8.179	0.012	0.075	0.004	0.008	0.032	0.114	0.000	0.001	0.067	0.034
AS	0.198	0.000	0.001	0.001	0.001	0.010	0.025	0.000	0.000	0.009	0.006
A_D	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BA	1.116	0.005	0.018	0.001	0.005	0.013	0.048	0.001	0.000	0.064	0.008
BE	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BZALC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CD	0.140	0.002	0.002	0.000	0.000	0.002	0.008	0.000	0.000	0.007	0.002
CLDN	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CO	1.974	0.005	0.014	0.001	0.001	0.010	0.078	0.000	0.000	0.032	0.009
CR_CRHEX	0.048	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.000
CU	1.376	0.013	0.015	0.004	0.012	0.036	0.781	0.001	0.001	0.048	0.028
DCB	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
DDT_R	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DIOXIN_FURAN	28.766	0.090	2.437	0.374	0.494	2.054	6.416	0.023	0.098	4.412	0.064
DN_TOL	0.111	0.000	0.001	0.000	0.004	0.001	0.002	0.000	0.000	0.005	0.002
E_I	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	34.641	0.048	0.329	0.020	0.263	0.161	1.805	0.002	0.007	0.307	0.153
HG	0.016	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
HMX	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.302	0.001	0.003	0.000	0.002	0.002	0.006	0.000	0.000	0.003	0.002
NB	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NI	0.036	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.000
NNDPA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PAH	0.046	0.000	0.000	0.000	0.138	0.001	0.534	0.000	0.000	0.001	0.004
PB	4.475	0.002	0.014	0.001	0.203	0.051	0.315	0.003	0.001	0.727	0.068
PCB_S	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PHENOL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PHTLAT	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RDX	0.167	0.000	0.001	0.000	0.028	0.001	0.003	0.000	0.000	0.002	0.000
SB	1.018	0.002	0.006	0.001	0.026	0.016	0.129	0.001	0.000	2.055	0.009
SE	2.545	0.004	0.016	0.003	0.021	0.027	0.075	0.001	0.001	0.045	0.013
TL	7.587	0.002	0.062	0.006	0.009	0.047	0.155	0.000	0.002	0.112	0.016
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	0.299	0.000	0.003	0.000	0.000	0.001	0.005	0.000	0.000	0.004	0.001
ZN	1.736	0.009	0.010	0.003	0.027	0.041	0.139	0.000	0.000	0.026	0.025
HI[e] TOTAL	**95.2**	**0.2**	**3.0**	**0.4**	**1.4**	**2.5**	**10.7**	**0.0**	**0.1**	**7.9**	**0.4**

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-57. Final Hazard Indices for All Exposure Pathways for the Kit Fox (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	0.074	0.001	0.193
24D	0.318	0.005	0.012
AG	0.003	0.000	0.000
AL	8.179	0.120	0.239
AS	0.198	0.011	0.020
A_D	0.001	0.000	0.000
BA	1.116	0.029	0.082
BE	0.001	0.000	0.000
BZALC	0.000	0.000	0.000
CD	0.140	0.005	0.015
CLDN	0.001	0.000	0.000
CO	1.974	0.033	0.059
CR_CRHEX	0.048	0.001	0.002
CU	1.376	0.054	0.315
DCB	0.001	0.000	0.001
DDT_R	0.001	0.000	0.000
DIOXIN_FURAN	28.766	0.297	13.750
DN_TOL	0.111	0.006	0.011
E_I	0.000	0.000	0.000
ENDOSULFAN	ND	ND	ND
FE	34.641	0.562	1.977
HG	0.016	0.000	0.001
HMX	0.007	0.000	0.000
H_HE	ND	ND	ND
LIN	ND	ND	ND
MN	0.302	0.005	0.011
NB	0.017	0.000	0.001
NI	0.036	0.001	0.002
NNDPA	0.000	0.000	0.000
PAH	0.046	0.034	0.320
PB	4.475	0.515	1.201
PCB_S	0.007	0.001	0.000
PHENOL	0.000	0.000	0.000
PHTLAT	0.001	0.001	0.000
RDX	0.167	0.003	0.034
SB	1.018	0.176	0.210
SE	2.545	0.022	0.113
TL	7.587	0.127	0.284
TPHC	ND	ND	ND
V	0.299	0.005	0.011
ZN	1.736	0.036	0.159
HI[d] TOTAL	95.2	2.1	19.0

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-58. Final Hazard Indices for Plants for the Soil Exposure Pathway (TEAD Historic Data)

Group	RSA[b]	SWMU[a]														
		01	1b	1c	03	04	06	07	08	10	11	12	13	14	15	19
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.476	293.647	ND	ND	ND	ND	ND	ND	ND	137.211	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.201	1.670	ND	ND	133.013	ND	0.208	ND	0.242	ND	0.472	ND	ND	48.380	0.947	ND
AL	12.376	29.049	ND	ND	ND	ND	ND	30.368	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.850	ND	ND	ND	ND	0.859	2.800	2.553	0.932	ND	1.295	1.210	ND	2.096	2.763	ND
A_D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BA	0.162	1.445	ND	ND	ND	0.296	0.354	0.352	0.389	ND	0.223	ND	ND	0.720	0.412	ND
BE	0.063	0.085	ND	ND	ND	0.090	ND	0.052	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CD	0.200	4.337	1.687	ND	0.444	6.926	0.496	0.288	ND	ND	4.294	ND	ND	13.780	1.454	0.784
CLDN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CO	0.292	0.232	ND	ND	0.333	0.851	0.235	0.338	0.368	ND	0.210	ND	ND	ND	0.392	ND
CR_CRHEX	0.165	0.253	ND	ND	1.848	3.170	0.219	0.263	0.276	ND	0.568	ND	0.153	1.960	3.174	0.204
CU	0.173	53.021	ND	ND	1.080	0.689	0.457	0.164	2.018	ND	52.161	ND	ND	4.100	3.391	4.110
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIOXIN_FURAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	0.001	0.002	ND	ND	ND	ND	0.003	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HG	0.121	0.295	ND	ND	1.424	0.157	0.254	ND	0.110	ND	1.769	ND	0.139	6.208	0.563	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.482	ND	ND	ND	ND	0.716	ND	1.070	ND	ND	1.533	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.040	0.057	ND	ND	ND	0.142	0.034	0.050	0.066	ND	0.174	ND	ND	0.125	0.039	0.044
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.120	ND	ND	ND	ND	0.084	ND	ND	ND	ND	0.005	0.477	0.007	0.158	6.666	0.030
PB	0.053	8.504	0.058	ND	0.058	0.849	1.935	0.089	10.146	ND	6.823	0.144	0.023	0.478	0.372	0.277
PCB_S	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.003	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.028	ND	ND	ND	0.013	0.056	ND	ND	ND	ND	0.202	ND	0.057	0.228	0.006	0.027
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	0.100	2.404	ND	ND	ND	0.531	ND	ND	5.456	ND	14.710	ND	ND	ND	2.278	ND
SE	0.225	ND	ND	ND	0.574	ND	ND	ND	ND	ND	0.479	ND	ND	2.438	0.359	ND
TL	17.150	8.480	ND	ND	ND	22.411	ND	ND	ND	ND	ND	ND	ND	11.014	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	6.717	ND	ND	ND	ND	ND	10.490	14.028	13.622	ND	ND	ND	ND	ND	14.545	ND
ZN	0.961	202.123	ND	ND	3.212	11.811	3.633	5.238	1.655	ND	15.031	ND	ND	25.200	6.906	73.200
HI[d]_TOTAL	**41.0**	**605.6**	**1.7**	**0.00**	**142.0**	**49.6**	**21.1**	**54.9**	**35.3**	**137.2**	**100.0**	**1.8**	**0.4**	**116.9**	**44.3**	**78.7**

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Table 7-58. Final Hazard Indices for Plants for the Soil Exposure Pathway (TEAD Historic Data) (continued)

		SWMU														
Group	RSA	20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.476	ND	1508.239	1548.681	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.201	ND	3.239	0.266	0.238	2.149	0.360	ND	ND	ND	ND	ND	ND	ND	ND	0.234
AL	12.376	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.856	ND	ND	ND	ND	ND
AS	0.850	0.676	1.312	1.778	1.948	1.564	0.791	1.586	1.913	1.640	0.946	ND	1.530	1.274	6.172	0.999
A_D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BA	0.162	1.007	8.042	ND	0.216	0.265	ND	ND	ND	ND	0.385	ND	ND	ND	ND	0.382
BE	0.063	ND	0.120	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CD	0.200	2.860	96.213	ND	1.844	0.727	1.282	4.384	2.170	0.194	2.217	ND	1.153	0.697	0.202	ND
CLDN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CO	0.292	ND	0.318	0.261	0.251	0.203	ND	ND	ND	ND	0.269	ND	ND	ND	0.390	0.167
CR_CRHEX	0.165	0.405	17.244	0.241	1.048	0.395	0.808	3.285	0.307	0.555	1.399	ND	0.450	0.247	ND	0.201
CU	0.173	4.999	81.580	0.177	0.485	0.815	2.782	0.408	0.203	ND	0.328	ND	0.254	0.384	0.190	2.567
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIOXIN_FURAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	0.001	ND	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HG	0.121	0.105	0.180	ND	0.223	1.947	0.108	17.224	ND	ND	0.178	ND	ND	ND	ND	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.482	ND	1.420	ND	ND	0.700	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.040	0.084	0.307	0.065	0.036	0.031	0.036	0.057	ND	ND	0.050	ND	ND	0.056	ND	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.120	0.040	0.018	ND	0.412	ND	0.095	ND	ND	0.049	ND	0.064	0.002	ND	ND	ND
PB	0.053	2.939	36.713	0.072	0.301	1.604	0.561	0.911	0.188	0.110	0.339	0.073	0.128	0.384	0.131	0.801
PCB_S	0.002	ND	ND	ND	0.100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.028	0.033	0.014	ND	0.011	ND	ND	ND	0.020	ND	ND	0.010	ND	ND	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	0.100	3.177	44.257	ND	ND	1.609	0.995	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.225	ND	1.762	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.287	ND	ND
TL	17.150	7.985	36.719	ND	ND	ND	4.399	13.718	13.842	ND	ND	ND	ND	12.490	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	6.717	ND	ND	ND	ND	26.644	ND	ND	ND	ND	12.307	ND	ND	ND	ND	ND
ZN	0.961	14.493	186.605	3.303	8.053	3.065	26.869	8.520	ND	3.780	4.260	ND	ND	9.352	2.171	4.657
HI_TOTAL	**41.0**	**38.8**	**2024.3**	**1554.8**	**15.2**	**41.7**	**39.1**	**50.1**	**18.6**	**6.3**	**45.5**	**0.1**	**3.5**	**25.2**	**9.3**	**10.0**

Table 7-58. Final Hazard Indices for Plants for the Soil Exposure Pathway (TEAD Historic Data) (continued)

Group	RSA	SWMU 37	38	40	42	45	46	47
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.476	0.234	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.201	ND	ND	0.203	3.434	0.509	ND	ND
AL	12.376	ND	ND	ND	ND	ND	ND	ND
AS	0.850	ND	ND	1.689	2.192	4.967	0.635	ND
A_D	ND	ND	ND	ND	ND	ND	ND	ND
BA	0.162	ND	ND	0.435	14.166	ND	ND	ND
BE	0.063	ND	ND	ND	0.053	ND	ND	ND
BZALC	ND	ND	ND	ND	ND	ND	ND	ND
CD	0.200	0.230	0.343	0.363	3.527	1.417	0.782	ND
CLDN	ND	ND	ND	ND	ND	ND	ND	ND
CO	0.292	ND	ND	0.203	0.294	0.256	ND	ND
CR_CRHEX	0.165	ND	ND	0.189	1.208	0.658	0.481	ND
CU	0.173	ND	0.263	0.355	31.071	0.869	0.333	ND
DCB	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	ND	ND	ND	ND	ND	ND	ND	ND
DIOXIN_FURAN	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	0.001	ND	ND	ND	0.004	ND	ND	ND
E_I	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND
FE	ND	ND	ND	ND	ND	ND	ND	ND
HG	0.121	ND	0.189	0.095	0.217	0.340	0.472	0.367
HMX	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.482	ND	ND	ND	0.562	ND	ND	ND
NB	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.040	ND	ND	0.031	0.160	0.061	0.052	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.120	0.355	0.046	ND	0.071	0.230	ND	ND
PB	0.053	0.067	0.072	0.242	22.492	0.671	0.522	0.525
PCB_S	0.002	ND	ND	ND	ND	ND	ND	ND
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.028	0.002	0.001	ND	0.003	0.203	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND
SB	0.100	ND	ND	ND	66.168	ND	0.362	1.744
SE	0.225	ND	ND	ND	ND	ND	ND	ND
TL	17.150	ND	10.678	ND	24.072	16.561	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND
V	6.717	ND	ND	11.751	ND	13.726	ND	ND
ZN	0.961	10.180	ND	1.679	24.613	7.258	3.594	ND
HI_TOTAL	**41.0**	**11.1**	**11.6**	**17.2**	**194.3**	**47.7**	**7.2**	**2.6**

[a]Solid Waste Management Unit
[b]Reference Study Area
[c]No Data or Pathway Incomplete
[d]Hazard Index

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Table 7-59. Final Hazard Indices for Plants for the Soil Exposure Pathway (TEAD Current Data)

GROUP	RSA[b]	SWMU[a] 1b	1c	10	11	12	15	21	37	42	45
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	0.476	0.476	0.476	0.476	0.476	0.476	0.476	0.476	0.476	0.476	0.476
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201
AL	12.376	15.205	16.164	5.466	5.082	6.671	10.219	10.863	6.699	7.478	19.998
AS	0.850	0.322	0.517	0.404	0.952	1.210	6.700	0.461	0.378	2.247	3.311
A_D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BA	0.162	0.342	0.266	0.100	0.290	0.246	0.464	0.788	0.121	0.807	0.286
BE	0.063	0.057	0.067	0.021	0.021	0.021	0.021	0.021	0.021	0.055	0.079
BZALC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CD	0.200	1.687	0.200	0.200	0.713	0.200	2.000	6.667	0.200	2.231	1.606
CLDN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CO	0.292	0.189	0.256	0.063	0.063	0.063	0.765	0.199	0.146	0.395	0.273
CR_CRHEX	0.165	0.195	0.200	0.088	0.331	0.156	0.656	0.235	0.115	0.186	0.861
CU	0.173	0.171	0.123	0.060	1.540	0.123	38.000	4.340	0.092	1.012	0.918
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIOXIN_FURA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.004	0.001
E_I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HG	0.121	0.083	0.083	0.184	0.271	0.083	2.830	0.193	0.083	0.309	0.512
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	0.482	0.580	0.552	0.228	0.658	0.314	0.610	0.422	0.278	0.362	0.740
NB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.040	0.034	0.041	0.021	0.143	0.019	0.048	0.054	0.026	0.079	0.060
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.120	0.115	0.115	0.115	0.115	0.573	75.796	0.115	0.614	0.143	5.646
PB	0.053	0.058	0.035	0.008	3.036	0.144	0.453	1.692	0.016	1.190	0.807
PCB_S	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.025
PHENOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	0.028	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.765
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	0.100	0.100	0.100	0.100	3.100	0.278	1.988	4.920	0.100	41.689	0.308
SE	0.225	0.225	0.225	0.225	0.225	0.225	0.733	0.225	0.225	0.484	0.225
TL	17.150	17.150	17.150	17.150	17.150	17.150	17.150	17.150	17.150	17.150	17.150
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	6.717	9.550	11.150	4.620	3.940	4.640	6.400	6.600	5.550	6.439	11.148
ZN	0.961	1.998	0.920	0.470	16.860	1.054	11.880	9.840	0.822	1.737	7.258
HI[d] TOTAL	41.0	48.8	48.9	30.2	55.2	33.9	177.4	65.5	33.3	84.7	72.7

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

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Table 7-60. Final Hazard Indices for Plants for the Soil Exposure Pathway (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a]	
		ESA-1	ESA-2
135TNB	ND[c]	ND	ND
246TNT	0.476	0.476	0.476
24D	ND	ND	ND
AG	0.201	0.201	0.201
AL	12.376	12.611	10.976
AS	0.850	2.438	1.767
A_D	ND	ND	ND
BA	0.162	0.594	0.335
BE	0.063	0.060	0.037
BZALC	ND	ND	ND
CD	0.200	1.739	1.737
CLDN	ND	ND	ND
CO	0.292	0.325	0.257
CR_CRHEX	0.165	0.423	0.272
CU	0.173	0.875	7.483
DCB	ND	ND	ND
DDT_R	ND	ND	ND
DIOXIN_FURAN	ND	ND	ND
DN_TOL	0.001	0.003	0.001
E_I	ND	ND	ND
ENDOSULFAN	ND	ND	ND
FE	ND	ND	ND
HG	0.121	0.337	0.620
HMX	ND	ND	ND
H_HE	ND	ND	ND
LIN	ND	ND	ND
MN	0.482	0.496	0.479
NB	ND	ND	ND
NI	0.040	0.067	0.053
NNDPA	ND	ND	ND
PAH	0.119	5.380	13.741
PB	0.053	0.935	0.783
PCB_S	0.002	0.025	0.002
PHENOL	ND	ND	ND
PHTLAT	0.029	0.790	0.017
RDX	ND	ND	ND
SB	0.100	25.986	1.492
SE	0.225	0.375	0.318
TL	17.150	17.150	17.150
TPHC	ND	ND	ND
V	6.717	8.398	7.331
ZN	0.961	3.797	6.061
HI[d] TOTAL	41.0	83.5	71.6

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-61. Final Hazard Indices for Soil Fauna for the Soil Exposure Pathway (TEAD Historic Data)

Group	RSA[b]	SWMU[a] 01	1b	1c	03	04	06	07	08	10	11	12	13	14	15	19
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AL	3.227	7.574	ND	ND	ND	ND	ND	7.917	ND	ND	ND	ND	ND	ND	ND	ND
AS	0.142	ND	ND	ND	ND	0.143	0.467	0.425	0.155	ND	0.216	0.202	ND	0.349	0.460	ND
A_D	0.00003	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	0.0001	ND	ND	0.001	ND
BA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CD	0.030	0.650	0.253	ND	0.067	1.039	0.074	0.043	ND	ND	0.644	ND	ND	2.067	0.218	0.118
CLDN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CO	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CR_CRHEX	30.880	47.525	ND	ND	346.571	594.285	41.139	49.402	51.750	ND	106.540	ND	28.730	367.500	595.122	38.243
CU	0.207	63.271	ND	ND	1.289	0.822	0.545	0.196	2.409	ND	62.244	ND	ND	4.893	4.047	4.905
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.00003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
DIOXIN_FURAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	10.653	23.205	ND	ND	ND	29.305	15.842	19.631	20.709	ND	53.338	ND	ND	ND	24.089	27.800
HG	0.036	0.088	ND	ND	0.427	0.047	0.076	ND	0.033	ND	0.531	ND	0.042	1.862	0.169	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	0.014	0.124	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.050	0.071	ND	ND	ND	0.177	0.042	0.062	0.082	ND	0.218	ND	ND	0.156	0.049	0.055
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.019	ND	ND	ND	ND	0.012	ND	ND	ND	ND	0.001	0.069	0.001	0.023	0.987	0.004
PB	0.043	6.932	0.047	ND	0.047	0.692	1.577	0.073	8.271	ND	5.562	0.117	0.019	0.390	0.304	0.226
PCB_S	0.0004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND
PHENOL	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.003	ND	ND	ND	0.008	ND	ND	ND	ND	ND	0.007	ND	ND	0.035	0.005	ND
TL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.240	50.531	ND	ND	0.803	2.953	0.908	1.309	0.414	ND	3.758	ND	ND	6.300	1.727	18.300
HI[d]_TOTAL	**45.5**	**200.0**	**0.3**	**0.00**	**349.2**	**629.5**	**60.7**	**79.1**	**83.8**	**0.00**	**233.1**	**0.4**	**28.8**	**383.6**	**627.2**	**89.7**

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Table 7-61. Final Hazard Indices for Soil Fauna for the Soil Exposure Pathway (TEAD Historic Data) (continued)

Group	RSA	20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
135TNB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AL	3.227	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.959	ND	ND	ND	ND	ND
AS	0.142	0.113	0.219	0.296	0.325	0.261	0.132	0.264	0.319	0.273	0.158	ND	0.255	0.212	1.029	0.167
A_D	0.00003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	ND	ND
BA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CD	0.030	0.429	14.432	ND	0.277	0.109	0.192	0.658	0.325	0.029	0.333	ND	0.173	0.105	0.030	ND
CLDN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CO	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CR_CRHEX	30.880	75.911	3233.233	45.199	196.407	74.141	151.559	615.923	57.575	104.000	262.228	ND	84.398	46.259	ND	37.686
CU	0.207	5.965	97.350	0.211	0.579	0.973	3.320	0.486	0.242	ND	0.391	ND	0.303	0.458	0.227	3.063
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.00003	ND	ND	ND	ND	ND	ND	ND	ND	0.002	ND	ND	ND	0.123	0.002	ND
DIOXIN_FURAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	10.653	12.011	47.927	16.659	16.457	49.401	ND	ND	ND	ND	17.132	ND	ND	ND	19.066	17.813
HG	0.036	0.031	0.054	ND	0.067	0.584	0.032	5.167	ND	ND	0.053	ND	ND	ND	ND	ND
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	0.014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NI	0.050	0.105	0.383	0.081	0.045	0.039	0.045	0.071	ND	ND	0.062	ND	ND	0.070	ND	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.019	0.006	0.003	ND	0.060	ND	0.014	ND	ND	0.007	ND	0.009	0.000	ND	ND	ND
PB	0.043	2.396	29.928	0.058	0.245	1.308	0.457	0.743	0.153	0.090	0.276	0.059	0.104	0.313	0.106	0.653
PCB_S	0.0004	ND	ND	ND	0.017	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENOL	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHTLAT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.003	ND	0.025	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004	ND	ND
TL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.240	3.623	46.651	0.826	2.013	0.766	6.717	2.130	ND	0.945	1.065	ND	ND	2.338	0.543	1.164
HI_TOTAL	45.5	100.6	3470.2	63.3	216.5	127.6	162.5	625.4	58.6	105.3	287.7	0.1	85.2	49.9	21.0	60.5

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Table 7-61. Final Hazard Indices for Soil Fauna for the Soil Exposure Pathway (TEAD Historic Data) (continued)

Group	RSA	37	38	40	42	45	46	47
135TNB	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND
AG	ND	ND	ND	ND	ND	ND	ND	ND
AL	3.227	ND	ND	ND	ND	ND	ND	ND
AS	0.142	ND	ND	0.282	0.365	0.828	0.106	ND
A_D	0.00003	ND	ND	ND	ND	0.044	ND	ND
BA	ND	ND	ND	ND	ND	ND	ND	ND
BE	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	ND	ND	ND	ND	ND	ND	ND	ND
CD	0.030	0.034	0.052	0.054	0.529	0.213	0.117	ND
CLDN	ND	ND	ND	ND	ND	ND	ND	ND
CO	ND	ND	ND	ND	ND	ND	ND	ND
CR_CRHEX	30.880	ND	ND	35.451	226.463	123.374	90.205	ND
CU	0.207	ND	0.314	0.424	37.078	1.036	0.397	ND
DCB	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.00003	ND	ND	ND	0.010	0.033	ND	ND
DIOXIN_FURAN	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND
E_I	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND
FE	10.653	ND	ND	13.133	18.084	ND	17.392	ND
HG	0.036	ND	0.057	0.029	0.065	0.102	0.142	0.110
HMX	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND
MN	ND	ND	ND	ND	ND	ND	ND	ND
NB	0.014	ND	ND	ND	ND	ND	ND	ND
NI	0.050	ND	ND	0.039	0.201	0.077	0.065	ND
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.019	0.054	0.007	ND	0.010	0.033	ND	ND
PB	0.043	0.055	0.059	0.197	18.335	0.547	0.426	0.428
PCB_S	0.0004	ND	ND	ND	ND	ND	ND	ND
PHENOL	0.001	ND	0.020	ND	ND	ND	ND	ND
PHTLAT	ND	ND	ND	ND	ND	ND	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.003	ND	ND	ND	ND	ND	ND	ND
TL	ND	ND	ND	ND	ND	ND	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.240	2.545	ND	0.420	6.153	1.815	0.898	ND
HI_TOTAL	**45.5**	**2.7**	**0.5**	**50.0**	**307.3**	**128.1**	**109.7**	**0.5**

[a]Solid Waste Management Unit
[b]Reference Study Area
[c]No Data or Pathway Incomplete
[d]Hazard Index

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Table 7-62. Final Hazard Indices for Soil Fauna for the Soil Exposure Pathway (TEAD Current Data)

		SWMU[a]									
GROUP	RSA[b]	1b	1c	10	11	12	15	21	37	42	45
135TNB	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
246TNT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AG	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AL	3.227	3.964	4.214	1.425	1.325	1.739	2.664	2.832	1.746	1.950	5.214
AS	0.142	0.054	0.086	0.067	0.159	0.202	1.117	0.077	0.063	0.375	0.552
A_D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
BA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BZALC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CD	0.030	0.253	0.030	0.030	0.107	0.030	0.300	1.000	0.030	0.335	0.241
CLDN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CO	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CR_CRHEX	30.880	36.500	37.500	16.525	62.000	29.250	123.000	44.000	21.475	34.808	161.492
CU	0.207	0.204	0.147	0.072	1.838	0.147	45.346	5.179	0.110	1.208	1.095
DCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DDT_R	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
DIOXIN_FURAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DN_TOL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E_I	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FE	10.653	12.600	14.700	6.530	47.900	6.130	36.800	10.200	8.170	6.512	17.311
HG	0.036	0.025	0.025	0.055	0.081	0.025	0.849	0.058	0.025	0.093	0.154
HMX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H_HE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
NI	0.050	0.042	0.051	0.026	0.179	0.023	0.060	0.068	0.032	0.099	0.075
NNDPA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH	0.019	0.018	0.018	0.018	0.018	0.085	11.242	0.018	0.090	0.022	0.903
PB	0.043	0.047	0.029	0.006	2.475	0.117	0.370	1.380	0.013	0.970	0.658
PCB_S	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
PHENOL	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.050
PHTLAT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RDX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SE	0.003	0.003	0.003	0.003	0.003	0.003	0.010	0.003	0.003	0.007	0.003
TL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZN	0.240	0.500	0.230	0.118	4.215	0.264	2.970	2.460	0.206	0.434	1.815
HI[d] TOTAL	45.5	54.2	57.0	24.9	120.3	38.0	224.7	67.3	32.0	46.8	189.6

[a]Solid waste management unit.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

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Table 7-63. Final Hazard Indices for Soil Fauna for the Soil Exposure Pathway (TEAD Current Data on an ESA Basis)

Group	RSA[b]	ESA[a] ESA-1	ESA[a] ESA-2
135TNB	ND[c]	ND	ND
246TNT	ND	ND	ND
24D	ND	ND	ND
AG	ND	ND	ND
AL	3.227	3.288	2.862
AS	0.142	0.406	0.295
A_D	0.000	0.001	0.000
BA	ND	ND	ND
BE	ND	ND	ND
BZALC	ND	ND	ND
CD	0.030	0.261	0.261
CLDN	ND	ND	ND
CO	ND	ND	ND
CR_CRHEX	30.880	79.263	51.067
CU	0.207	1.044	8.930
DCB	ND	ND	ND
DDT_R	0.000	0.000	0.000
DIOXIN_FURAN	ND	ND	ND
DN_TOL	ND	ND	ND
E_I	ND	ND	ND
ENDOSULFAN	ND	ND	ND
FE	10.653	10.972	19.415
HG	0.036	0.101	0.186
HMX	ND	ND	ND
H_HE	ND	ND	ND
LIN	ND	ND	ND
MN	ND	ND	ND
NB	0.014	0.014	0.014
NI	0.050	0.084	0.067
NNDPA	ND	ND	ND
PAH	0.019	0.865	2.094
PB	0.043	0.762	0.638
PCB_S	0.000	0.004	0.000
PHENOL	0.001	0.050	0.001
PHTLAT	ND	ND	ND
RDX	ND	ND	ND
SB	ND	ND	ND
SE	0.003	0.005	0.005
TL	ND	ND	ND
TPHC	ND	ND	ND
V	ND	ND	ND
ZN	0.240	0.949	1.515
HI[d] TOTAL	45.5	98.1	87.3

[a]Ecological study area.
[b]Reference study area.
[c]No data or pathway incomplete.
[d]Hazard index.

Table 7-64. Summary of Hazard Indices by Location and Receptor (TEAD Historic)

Receptor	RSA[b]	SWMU[a] 01	1b	1c	03	04	06	07	08	10	11	12	13	14	15	19
Passerines	90.2	643.2	7.0	0.01	16.9	104.4	95.6	61.2	304.8	1.7	397.6	5.0	7.3	224.4	211.7	172.1
American Kestrel	5.0	19.9	0.001	0.00005	0.001	0.01	0.3	0.6	0.03	0.001	0.3	0.01	0.025	0.2	2.4	0.1
Great Horned Owl	1.8	0.7	0.00002	0.000001	0.00003	0.0002	0.01	0.02	0.002	0.00002	0.01	0.0005	0.0007	0.004	0.1	0.002
Golden Eagle	4.1	1.3	0.00004	0.000003	0.0001	0.0004	0.02	0.03	0.004	0.00004	0.03	0.001	0.001	0.01	0.1	0.005
Bald Eagle	4.1	1.3	0.00004	0.000003	0.0001	0.0004	0.02	0.03	0.004	0.00004	0.03	0.001	0.001	0.01	0.1	0.005
Deer Mouse	28.4	186.8	0.2	0.003	0.2	10.2	30.3	41.2	65.8	35.8	130.1	0.7	0.11	11.1	41.7	46.2
Mule Deer	3.5	16.7	0.0001	0.00004	0.0001	0.003	0.4	1.0	0.1	0.03	0.5	0.01	0.001	0.02	1.3	0.1
Jackrabbit	9.5	53.0	0.001	0.0004	0.001	0.04	4.0	10.6	0.6	0.4	3.6	0.1	0.01	0.2	14.4	0.7
Kit Fox	44.0	15.4	0.0001	0.00004	0.0001	0.004	0.4	1.1	0.1	0.03	0.8	0.01	0.001	0.02	1.4	0.1
Plants	41.0	605.6	1.7	0	142.0	49.6	21.1	54.9	35.3	137.2	100.0	1.8	0.4	116.9	44.3	78.7
Soil Fauna	45.5	200.0	0.3	0	349.2	629.5	60.7	79.1	83.8	0	233.1	0.4	28.8	383.6	627.2	89.7

Table 7-64. Summary of Hazard Indices by Location and Receptor (TEAD Historic) (continued)

Receptor	RSA	SWMU 20	21	22	23	25	26	27	28	29	30	31	32	34	35	36
Passerines	90.2	173.7	1047.5	8.1	115.0	157.1	104.1	226.7	73.4	37.7	113.4	1.8	4.5	49.7	85.5	72.2
American Kestrel	5.0	0.1	0.1	0.001	0.02	0.1	0.7	0.03	0.03	0.1	0.5	0.0002	0.0003	0.003	0.3	0.02
Great Horned Owl	1.8	0.005	0.002	0.00002	0.001	0.003	0.02	0.001	0.001	0.004	0.02	0.00002	0.00001	0.0001	0.01	0.001
Golden Eagle	4.1	0.01	0.004	0.00003	0.001	0.005	0.04	0.002	0.002	0.01	0.03	0.00004	0.00002	0.0001	0.02	0.001
Bald Eagle	4.1	0.01	0.004	0.00003	0.001	0.005	0.04	0.002	0.002	0.01	0.03	0.00004	0.00002	0.0001	0.02	0.001
Deer Mouse	28.4	34.2	134.1	31.7	25.6	75.4	6.9	8.8	5.2	0.9	35.5	0.3	0.07	0.8	27.9	29.5
Mule Deer	3.5	0.1	0.04	0.01	0.02	0.1	0.1	0.003	0.005	0.01	0.5	0.0003	0.00002	0.0002	0.3	0.03
Jackrabbit	9.5	1.0	0.4	0.1	0.1	1.4	1.2	0.04	0.06	0.1	4.7	0.004	0.0002	0.003	3.3	0.3
Kit Fox	44.0	0.1	0.03	0.01	0.03	0.1	0.1	0.003	0.005	0.01	0.5	0.0003	0.00002	0.0002	0.3	0.03
Plants	41.0	38.8	2024.3	1554.8	15.2	41.7	39.1	50.1	18.6	6.3	45.5	0.1	3.5	25.2	9.3	10.0
Soil Fauna	45.5	100.6	3470.2	63.3	216.5	127.6	162.5	625.4	58.6	105.3	287.7	0.1	85.2	49.9	21.0	60.5

Table 7-64. Summary of Hazard Indices by Location and Receptor (TEAD Historic) (continued)

Receptor	RSA	SWMU 37	38	40	42	45	46	47
Passerines	90.2	24.4	17.0	44.5	875.4	162.9	34.6	197.7
American Kestrel	5.0	0.004	0.001	0.3	3.7	0.2	0.00	0.04
Great Horned Owl	1.8	0.0001	0.00003	0.01	0.2	0.005	0.0001	0.001
Golden Eagle	4.1	0.0002	0.00008	0.02	0.4	0.01	0.0001	0.002
Bald Eagle	4.1	0.0002	0.00008	0.02	0.3	0.01	0.0001	0.002
Deer Mouse	28.4	27.9	1.0	38.6	168.8	12.5	5.0	5.0
Mule Deer	3.5	0.01	0.0003	0.8	3.8	0.04	0.002	0.002
Jackrabbit	9.5	0.1	0.003	8.4	41.3	0.4	0.02	0.02
Kit Fox	44.0	0.01	0.0003	0.8	3.9	0.04	0.002	0.002
Plants	41.0	11.1	11.6	17.2	194.3	47.7	7.2	2.6
Soil Fauna	45.5	2.7	0.5	50.0	307.3	128.1	109.7	0.5

[a]Solid Waste Management Unit.
[b]Reference Study Area.

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Table 7-65. Summary of Hazard Indices for TEAD Ecological Receptors (SWMU Basis - Current)

	Location										
		SWMU									
Receptor	**RSA**	**1B**	**1C**	**10**	**11**	**12**	**15**	**21**	**37**	**42**	**45**
Passerines	125	182	169	152	506	156	367	148	158	239	230
American Kestrel	13	0	2	0	1	2	9	0	0	5	1
Great Horned Owl	4	0	0	0	0	0	0	0	0	0	0
Golden Eagle	8	0	0	0	0	0	1	0	0	0	0
Bald Eagle	8	0	0	0	0	0	1	0	0	0	0
Deer Mouse	90	82	86	1543	175	50	153	62	129	84	90
Mule Deer	13	0	2	5	1	1	5	0	0	3	0
Jackrabbit	35	0	16	52	4	6	59	0	1	30	4
Kit Fox	95	0	3	0	1	3	11	0	0	8	0
Plants	41	49	49	30	55	34	177	65	33	85	73
Soil Fauna	46	54	57	25	120	38	225	67	32	47	190

Table 7-66. Summary of Hazard Indices for TEAD Ecological Receptors (ESA Basis)

	Location		
Receptor	**RSA** [a]	**ESA-1**[b]	**ESA-2**
Passerines	125	202	274
American Kestrel	13	2	14
Great Horned Owl	4	0	1
Golden Eagle	8	0	1
Bald Eagle	8	0	1
Deer Mouse	90	90	310
Mule Deer	13	3	32
Jackrabbit	35	36	196
Kit Fox	95	2	19
Plants	41	83	72
Soil Fauna	46	98	87

[a]Reference Study Area.
[b]Ecological Study Area.

Table 7-67. Impact of Iron and Aluminum on TEAD Hazard Indices by Receptor for SWMUs With Unacceptable Ecological Risk

SWMU[a]	Receptor/ Database	Total HI[b]	Fe HQEP[c]	Fe %[d]	Al HQEP	Al %[e]	Fe & Al %
1/1d	Passerine Birds (Historic)	643	43	7			7
	American Kestrel (Historic)	19.9	1.8	9			9
	Deer Mouse (Historic)	187	32	17	11	6	23
	Mule Deer (Historic)	17	3.7	22	1	6	28
	Jackrabbit (Historic)	53	11.6	22	2.5	5	27
	Kit Fox (Historic)	15.4	3.7	24	1	6	30
	Plants (Historic)	606			29	5	5
	Soil Fauna (Historic)	200	23	12	7.6	4	16
8	Passerine Birds (Historic)	305	38	12			12
	Deer Mouse (Historic)	66	28	42			42
	Soil Fauna (Historic)	84	21	25			25
10	Passerine Birds (Current)	152	14	9			9
	Plants (Current)	30			5.5	18	18
	Soil Fauna (Current)	25	6.5	26			26
11	Passerine Birds (Historic)	398	98	25			25
	Deer Mouse (Historic)	130	72	55			55
	Jackrabbit (Historic)	3.6	1.8	50			50
	Plants (Current)	55			5	9	9
	Soil Fauna (Current)	120	48	40			40

Table 7-67. Impact of Iron and Aluminum on TEAD Hazard Indices by Receptor for SWMUs With Unacceptable Ecological Risk (continued)

SWMU[a]	Receptor/ Database	Total HI[b]	Fe HQEP[c]	Fe %[d]	Al HQEP	Al %[e]	Fe & Al %
12	Passerine Birds (Current)	156	12	8			8
	Deer Mouse (Current)	50	11	22	3.3	7	29
	Jackrabbit (Current)	6	1.2	20			20
	Plants (Current)	34			7	20	20
	Soil Fauna (Current)	38	6	16	2	5	21
15	Passerine Birds (Historic)	211	44	21			21
	American Kestrel (Historic)	2.4	0.5	22			22
	Deer Mouse (Historic)	42	33	80			78
	Mule Deer (Historic)	1.3	1.1	84			84
	Jackrabbit (Historic)	14.4	12	82			82
	Kit Fox (Historic)	1.4	1.1	79			79
	Plants (Current)	177	.		10	6	6
	Soil Fauna (Historic)	627	24	4			4
21	Passerine Birds (Historic)	1047	37	4			4
	Deer Mouse (Historic)	134	15	11			11
	Soil Fauna (Historic)	3470	48	1			1
	Soil Fauna (Current)	67	10	15			15
42	Passerine Birds (Historic)	875	33	4			4

Table 7-67. Impact of Iron and Aluminum on TEAD Hazard Indices by Receptor for SWMUs With Unacceptable Ecological Risk (continued)

SWMU[a]	Receptor/ Database	Total HI[b]	Fe HQEP[c]	Fe %[d]	Al HQEP	Al %[e]	Fe & Al %
42 (cont.)	Deer Mouse (Historic)	169	25	15			15
	Jackrabbit (Historic)	41	6	15			15
	Soil Fauna (Historic)	307	18	6			6

[a]Solid waste management unit.
[d]Iron.
[c]Hazard quotient by exposure pathway.
[e]Aluminum.
[b]Hazard index.

Table 7-68. Evaluation of TEAD Assessment and Measurement Endpoint #1 Used in the SWERA

SWMU [a]	Measured Concentration of COPCs [b] in Biota	Vegetation Diversity or Community Structure	Small Mammal Density	Small Mammal Diversity	Small Mammal Age Ratio	Small Mammal Sex Ratio	Small Mammal Body Weight	Dietary HQs[c]	Comments
1/1d	ND [d]	ND	ND	ND	ND	ND	ND	ND	NA [e] - biota not sampled.
1b/1c	YES [f]	Moderately similar to RSA [g]	Similar to RSA-strong association with percent litter, rock, and road in SWMU	Lower than RSA - strong association with % litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Similar to RSA	$0 \le HQ \le 53$	HIs [h] on the basis of biota analytical data suggests slight potential for adverse ecological effects, however biometric data do not indicate detrimental effects to receptor populations.
3	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
4	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
5	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
6	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
7	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
8	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
9	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
10	YES	Moderately similar to RSA	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with % litter, bare ground and road in SWMU	More subadults than RSA	Similar to RSA	Lower than RSA	$0 \le HQ \le 1435$	Biota analytical data suggest potential for adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
11	YES	Moderately similar to RSA	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with percent litter, bare ground and road in SWMU	More subadults than RSA	Similar to RSA	Lower than RSA	$0 \le HQ \le 118$	Evidence suggests potential for slight adverse ecological effects, however, biometric data strongly correlate with physical disturbance.

Table 7-68. *Evaluation of TEAD Assessment and Measurement Endpoint #1 Used in the SWERA (continued)*

SWMU [a]	Measured Concentration of COPCs [b] in Biota	Vegetation Diversity or Community Structure	Small Mammal Density	Small Mammal Diversity	Small Mammal Age Ratio	Small Mammal Sex Ratio	Small Mammal Body Weight	Dietary HQs[c]	Comments
12/15	YES	Moderately similar to RSA	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with percent litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Higher than RSA	$0 \leq HQ \leq 54$	Evidence from the dietary HQs suggests slight potential for adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
13	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
14 (Terrestrial only)	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
17	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
18	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
19	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
20	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
21	YES	Similar to RSA	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with percent litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Similar to RSA	$0 \leq HQ \leq 26$	Evidence suggests potential for slight adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
22	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
23	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
24	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
25	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
26	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
27	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
28	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
29	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.

Table 7-68. Evaluation of TEAD Assessment and Measurement Endpoint #1 Used in the SWERA (continued)

SWMU [a]	Measured Concentration of COPCs [b] in Biota	Vegetation Diversity or Community Structure	Small Mammal Density	Small Mammal Diversity	Small Mammal Age Ratio	Small Mammal Sex Ratio	Small Mammal Body Weight	Dietary HQs[c]	Comments
30	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
31	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
32	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
33	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
34	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
35	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
36	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
37	YES	Similar to RSA	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with percent litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Similar to RSA	$0 \leq HQ \leq 73$	Evidence suggests potential for slight adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
38	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
39	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
40	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
42	YES	Moderately similar to RSA	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with percent litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Similar to RSA	$0 \leq HQ \leq 53$	Evidence suggests slight potential for adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
43	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
44	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.

Table 7-68. *Evaluation of TEAD Assessment and Measurement Endpoint #1 Used in the SWERA (continued)*

SWMU [a]	Measured Concentration of COPCs [b] in Biota	Vegetation Diversity or Community Structure	Small Mammal Density	Small Mammal Diversity	Small Mammal Age Ratio	Small Mammal Sex Ratio	Small Mammal Body Weight	Dietary HQs[c]	Comments
45	YES	Moderately similar to RSA	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with percent litter, bare ground and road in SWMU	Similar to RSA	Similar to RSA	Lower than expected	$0 \leq HQ \leq 21$	Evidence suggests slight potential for minimal adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
46	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
47	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
48	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
49	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
50	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
51	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
52	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
53	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
54	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
55	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
56	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
57	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
AOC-3	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.
AOC-4	ND	ND	ND	ND	ND	ND	ND	ND	NA - biota not sampled.

Note.—Assessment endpoint (1): protection of mammals, birds, and special status species from adverse effects due to elevated concentrations of COPCs in forage/prey species. Measurement endpoint (1): concentrations of COPCs in biota. Food web model output for SWMUs with no biota data. Vegetation and small mammal biometric data including distribution, abundance, occurrence, density, diversity, age, sex, body weight.

[a]Solid waste management unit.
[b]Chemicals of potential concern.
[c]Hazard quotients.
[d]No data.
[e]Not applicable.
[f]Yes - biota were collected and analyzed.
[g]Reference study area.
[h]Hazard Indices.

Table 7-69. Evaluation of TEAD Assessment and Measurement Endpoint #2 Used in the SWERA

SWMU[a] No.	Vegetation Diversity or Community Structure	Small Mammal Density	Small Mammal Diversity	Small Mammal Age Ratio	Small Mammal Sex Ratio	Small Mammal Body Weight	Soil HQs[b]	HIs[c]	Comments
1/1d	ND [d]	ND	ND	ND	ND	ND	$0 \leq HQ \leq 294$	$0 < HI < 643$	Analytical data suggest potential for adverse ecological effects.
1b/1c	Moderately similar to RSA [e]	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with % litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Similar to RSA	$0 \leq HQ \leq 49$	$0<HI<96$	Soil analytical data suggest slight potential for adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
3	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 347$	$0 \leq HI \leq 349$	Analytical data suggest potential for adverse ecological effects.
4	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 594$	$0 \leq HI \leq 630$	Analytical data suggest potential for adverse ecological effects.
6	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 47$	$0 \leq HI \leq 96$	Analytical data suggest slight potential for adverse ecological effects.
7	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 49$	$0 \leq HI \leq 79$	Analytical data suggest slight potential for adverse ecological effects.
8	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 248$	$0 \leq HI \leq 305$	Analytical data suggest potential for adverse ecological effects.
10	Moderately similar to RSA	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with % litter, bare ground and road in SWMU	More subadults than RSA	Similar to RSA	Lower than RSA	$0 \leq HQ \leq 137$	$0 \leq HI \leq 137$	Soil analytical data suggest slight potential for adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
11	Moderately similar to RSA	Similar to RSA-strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with % litter, bare ground and road in SWMU	More subadults than RSA	Similar to RSA	Lower than RSA	$0 \leq HQ \leq 167$	$0 \leq HI \leq 398$	Soil analytical data suggest potential for adverse ecological effects, however, biometric data strongly correlate with physical disturbance.

Table 7-69. Evaluation of TEAD Assessment and Measurement Endpoint #2 Used in the SWERA (continued)

SWMU[a] No.	Vegetation Diversity or Community Structure	Small Mammal Density	Small Mammal Diversity	Small Mammal Age Ratio	Small Mammal Sex Ratio	Small Mammal Body Weight	Soil HQs[b]	HIs[c]	Comments
12/15	Moderately similar to RSA	Similar to RSA- strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with % litter, bare ground and road in SWMU	Fewer adults than RSA	Similar to RSA	Higher than RSA	$0 \le HQ \le 595$	$0 \le HI \le 627$	Soil analytical data suggest potential for adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
13	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 29$	$0 \le HI \le 29$	Analytical data suggest minimal potential for adverse ecological effects.
14	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 368$	$0.004 \le HI \le 384$	Analytical data suggest potential for adverse ecological effects.
19	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 97$	$0.002 \le HI \le 172$	Analytical data suggest moderate potential for adverse ecological effects.
20	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 76$	$0.004 \le HI \le 174$	Analytical data suggest moderate potential for adverse ecological effects.
21	Moderately similar to RSA	Similar to RSA- strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with % litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Higher than RSA	$0 \le HQ \le 3233$	$0 \le HI \le 3470$	Soil analytical data suggest potential for adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
22	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 1549$	$0 \le HI \le 1555$	Analytical data suggest potential for adverse ecological effects.
23	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 196$	$0 \le HI \le 216$	Analytical data suggest potential for adverse ecological effects.
25	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 91$	$0 \le HI \le 157$	Analytical data suggest slight potential for adverse ecological effects.
26	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 152$	$0 \le HI \le 162$	Analytical data suggest minimal potential for adverse ecological effects.

Table 7-69. Evaluation of TEAD Assessment and Measurement Endpoint #2 Used in the SWERA (continued)

SWMU[a] No.	Vegetation Diversity or Community Structure	Small Mammal Density	Small Mammal Diversity	Small Mammal Age Ratio	Small Mammal Sex Ratio	Small Mammal Body Weight	Soil HQs[b]	HIs[c]	Comments
27	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 615$	$0 \leq HI \leq 625$	Analytical data suggest potential for adverse ecological effects.
28	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 58$	$0 \leq HI \leq 73$	Analytical data suggest minimal potential for adverse ecological effects.
29	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 104$	$0 \leq HI \leq 105$	Analytical data suggest minimal potential for adverse ecological effects.
30	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 262$	$0 \leq HI \leq 288$	Analytical data suggest moderate potential for adverse ecological effects.
31	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 1.8$	$0 \leq HI \leq 1.8$	Analytical data suggest minimal potential for adverse ecological effects.
32	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 84$	$0 \leq HI \leq 85$	Analytical data suggest minimal potential for adverse ecological effects.
34	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 46$	$0 \leq HI \leq 50$	Analytical data suggest minimal potential for adverse ecological effects.
35	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 37$	$0 \leq HI \leq 86$	Analytical data suggest minimal potential for adverse ecological effects.
36	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 38$	$0 \leq HI \leq 72$	Analytical data suggest minimal potential for adverse ecological effects.
37	Similar to RSA	Similar to RSA- strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with % litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Similar to RSA	$0 \leq HQ \leq 49$	$0 \leq HI \leq 78$	Evidence suggests potential for slight adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
38	ND	ND	ND	ND	ND	ND	$0 \leq HQ \leq 15$	$0 \leq HI \leq 17$	Analytical data suggest minimal potential for adverse ecological effects.

Table 7-69. *Evaluation of TEAD Assessment and Measurement Endpoint #2 Used in the SWERA (continued)*

SWMU[a] No.	Vegetation Diversity or Community Structure	Small Mammal Density	Small Mammal Diversity	Small Mammal Age Ratio	Small Mammal Sex Ratio	Small Mammal Body Weight	Soil HQs[b]	HIs[c]	Comments
40	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 35$	$0 \le HI \le 50$	Analytical data suggest minimal potential for adverse ecological effects.
42	Moderately similar to RSA	Similar to RSA- strong association with % litter, rock, and road in SWMU	Lower than RSA- strong association with % litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Similar to RSA	$0 \le HQ \le 550$	$0.3 \le HI \le 875$	Evidence suggests potential for adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
45	Moderately similar to RSA	Similar to RSA- strong association with % litter, rock, and road in SWMU	Lower than RSA - strong association with % litter, bare ground and road in SWMU	Similar to RSA	Similar to RSA	Lower than expected	$0 \le HQ \le 161$	$0 \le HI \le 190$	Evidence suggests potential for slight adverse ecological effects, however, biometric data strongly correlate with physical disturbance.
46	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 90$	$0 \le HI \le 110$	Analytical data suggest minimal potential for adverse ecological effects.
47	ND	ND	ND	ND	ND	ND	$0 \le HQ \le 185$	$0 \le HI \le 198$	Analytical data suggest slight potential for adverse ecological effects.

Note.—Assessment endpoint (2): protection of mammals, birds, and special status species from adverse effects due to elevated concentrations of COPCs in surface soils, or due to loss of forage of prey species as a result of elevated soil concentrations.
Measurement endpoint (2): concentrations of COPCs in surface soil. Vegetation and small mammal biometric data including distribution, abundance, occurrence, density, diversity, age, sex, body weight.

[a]Solid waste management unit.
[b]Hazard quotients.
[c]Hazard indices.
[d]No data.
[e]Reference study area.

Table 7-70. Evaluation of TEAD Assessment and Measurement Endpoint #3 Used in the SWERA

SWMU [a] No.	Measured Concentration of COPCs [b] in Surface Water	Vegetation Diversity or Community Structure	Small Mammal Density	Small Mammal Diversity	Small Mammal Age Ratio	Small Mammal Sex Ratio	Small Mammal Body Weight	Surface Water HIs[c]	Comment
11	YES [d]	Moderately similar to RSA [e]	Similar to RSA	Lower than RSA - strong association with % litter, bare ground and road in SWMU	More subadults than RSA	Similar to RSA	Lower than expected	All <1 except JR [f] which was 1.1	No Risk due to surface water
21	YES	Similar to RSA	Similar to RSA	Lower than RSA - strong association with % litter, bare ground and road in SWMU	Fewer subadults than RSA	Similar to RSA	Similar to RSA	All <1 except JR which was 1.1	No Risk due to surface water
23	YES	ND	ND	ND	ND	ND	ND	<1	No Risk due to surface water
45	YES	Moderately similar to RSA	Similar to RSA	Lower than RSA - strong association with % litter, bare ground and road in SWMU	Similar to RSA	Similar to RSA	Lower than expected	<1	No Risk due to surface water

Note.—Assessment endpoint (3): protection of mammals, birds, and special status species from adverse effects due to elevated concentrations of COPCs in surface water. Measurement endpoint (3): concentrations of COPCs in surface water. Vegetation and small mammal biometric data including distribution, abundance, occurrence, density, diversity, age, sex, body weight.

[a]Solid waste management unit.
[b]Chemicals of potential concern.
[c]Hazard indices.
[d]Surface water data were collected at this location.
[e]Reference study area.
[f]Jackrabbit.

Table 7-71. *Evaluation of TEAD Assessment and Measurement Endpoints #4 and #5 Used in the SWERA*

SWMU [a] No.	Measured Concentration of COPCs[b] in Surface Water	Measured Concentration of COPCS in Sediment	Modeled Concentration of COPCs in Diet	Duck HI[c]	Duckling HI	Shorebird HI	Comment
14	YES[d]	YES	YES	<1	18	57	EPC [e] was a maximum value for surface water and sediment, and modeled concentration in diet. Risk estimates likely to be overestimated by use of abiotic maxima. Wildlife benefits are obvious compared to possible detriments due to contamination.

Note.—Assessment endpoints (4 and 5): protection of waterfowl and waders from adverse effects due to elevated concentrations of COPCs in diet, sediment or surface water at the SWMU 14 Sewage Lagoons.
Measurement endpoints (4 and 5): Concentrations of COPCs in sediment and surface water. Food web model based upon predicted concentrations of COPCs in benthos.

[a]Solid waste management unit.
[b]Chemicals of potential concern.
[c]Hazard index.
[d]Data were collected at this location.
[e]Exposure point concentration.

Table 7-72. *Evaluation of TEAD Assessment and Measurement Endpoint #6 Used in the SWERA*

SWMU No.	Measured Concentration of COPCS in Surface Water	Measured Concentratio n of COPCS in Sediment	Modeled Concentration of COPCs in Waterfowl	Eagle HI	Comment
14	YES	YES	YES	<1	EPC was a maximum value in surface water, sediment and modeled concentration in diet. **No Risk**

Note.—Assessment endpoint (6): protection of bald eagle from adverse effects due to elevated concentrations of COPCs in waterfowl at the SWMU 14 Sewage Lagoons.
Assessment endpoint (6): food web model (aquatic) results for estimated concentrations of COPCs in waterfowl.

[a]Solid waste management unit.
[b]Chemicals of potential concern.
[c]Hazard index.
[d]Data were collected at this location.
[e]Exposure point concentration.

Table 7-73. SWMU 14 (Sewage Lagoons) Sediment and Surface Water Data (SAIC 1994)

Analyte	No. Detects/ No. Samples	Minimum Value	Maximum Value	Standard Deviation	Mean	UCL95	Units
Acetone (water)	1/10	4.00	59.0	17.4	9.50	20.3	μg/L[a]
Silver (sediment)	8/11	0.40	133.0	46.2	30.8	58.1	μg/g[b]
Aluminum (sediment)	11/11	5,320	21,700	5,696	12,313	15,679	μg/g
Aluminum (water)	2/10	56.0	174.0	46.7	78.1	107.1	μg/L
Arsenic (sediment)	3/11	1.25	37.0	12.1	11.4	18.6	μg/g
Bis-2-ethylhexyl phthalate	5/11	0.24	87.0	26.5	15.4	31.0	μg/g
Barium (sediment)	11/11	93.7	299.0	72.6	165.0	207.9	μg/g
Barium (water)	10/10	56.5	76.9	6.16	73.8	77.6	μg/L
Benzo(a)anthracene (sediment)	1/11	0.02	2.00	0.60	0.20	0.55	μg/g
Beryllium (sediment)	6/11	0.21	0.96	0.31	0.52	0.70	μg/g
Benzyl alcohol (sediment)	1/11	0.02	0.04	0.008	0.02	0.02	μg/g
Cadmium (sediment)	5/11	0.60	40.70	14.6	10.6	19.2	μg/g
Chrysene (sediment)	2/11	0.02	2.40	0.72	0.27	0.69	μg/g
Cobalt (sediment)	6/11	1.25	4.98	1.52	2.76	3.65	μg/g
Chromium (sediment)	11/11	15.7	176.0	51.9	56.6	87.2	μg/g
Chromium (water)	1/11[c]	8.40	19.90	N/A [d]	9.44	N/A	μg/L
Copper (sediment)	11/11	9.82	560.0	190.3	143.5	255.9	μg/g
Fluoride (water)	10/10	2,300	3,000	201.1	2,860	2,985	μg/L
Fluoranthene (sediment)	3/11	0.02	1.80	0.53	0.21	0.52	μg/g
Iron (sediment)	11/11	6,910	18,500	3,253	12,155	14,077	μg/g
Iron (water)	2/10	38.75	93.60	21.3	48.8	62.0	μg/L
Mercury (sediment)	6/11	0.03	5.56	1.77	1.14	2.19	μg/g

Table 7-73. SWMU 14 (Sewage Lagoons) Sediment and Surface Water Data (SAIC 1994) (continued)

Analyte	No. Detects/ No. Samples	Minimum Value	Maximum Value	Standard Deviation	Mean	UCL95	Units
Manganese (sediment)	9/11	4.94	301.0	103.0	164.3	225.2	μg/g
Manganese (water)	10/10	13.50	18.50	1.44	17.0	17.9	μg/L
Methyl n-butyl ketone (water)	1/10	0.50	1.70	0.38	0.62	0.86	μg/L
Nickel (sediment)	8/11	1.37	52.80	14.5	14.6	23.2	μg/g
Nitrate (water)	10/10	16.10	27.00	3.43	20.8	22.9	μg/L
Lead (sediment)	11/11	13.80	640.0	203.3	143.1	263.2	μg/g
Phenanthrene (sediment)	3/11	0.02	4.20	1.25	0.52	1.26	μg/g
Pyrene (sediment)	2/11	0.04	4.90	1.46	0.55	1.42	μg/g
Selenium (sediment)	2/11	0.22	6.40	2.08	1.50	2.73	μg/g
Sulfate (water)	10/10	210,000	220,000	5,164	216,000	219,200	μg/L
Vanadium (sediment)	10/11	0.71	34.90	10.3	21.6	27.6	μg/g
Zinc (sediment)	11/11	37.60	1,110	425.6	379.0	630.5	μg/g
1,1,1 Trichloroethane (water)	1/10	0.50	2.00	0.47	0.65	0.94	μg/L
3-Nitrotoluene (water)	1/10	1.45	21.00	6.18	3.41	7.24	μg/L

[a]Micrograms/liter equivalent to parts per billion (ppb).
[b]Micrograms/gram equivalent to parts per million (ppm).
[c]Only detect was a duplicate, flagged with an "H" which was discontinued June 1994.
[d]Not applicable.

Table 7-74. SWMU 14 Sewage Lagoons - Surface Water Data

Analyte	Minimum	Maximum	Mean	Standard Deviation
Aluminum	< 141	–	–	–
Arsenic	2.98	3.30	3.14	0.23
Barium	63.5	64.00	63.75	0.35
Beryllium	< 5			
Cadmium	< 4.01	–	–	–
Chromium	< 6.02	–	–	–
Cobalt	< 25	–	–	–
Copper	< 8.09	–	–	–
Iron	46.7	88.7	67.7	29.7
Lead	2.28	3.58	2.93	0.92
Manganese	24.3	24.7	24.5	0.28
Mercury	< 0.243	–	–	–
Nickel	< 34.3	–	–	–
Selenium	< 3.02	–	–	–
Silver	< 4.6	–	–	–
Thallium	< 6.99	–	–	–
Vanadium	< 11	–	–	–
Zinc	< 21.1	–	–	–
Chloroform	0.62	0.62	0.62	–

Note.—Units of measurement in micrograms per liter (μg/L), which is equivalent to parts per billion (ppb). Data represent the only two surface water samples collected.

Source: Montgomery-Watson 1992.

Table 7-75. SWMU 14 Sediment Data

Analyte	Minimum	Maximum	Mean	Standard Deviation
Aluminum	3,910	12,600	8128	4,313.6
Arsenic	3.95	33.60	17.45	15.54
Barium	85.50	360.0	228.13	142.48
Beryllium	0.25	1.17	0.70	0.52
Cadmium	0.35	42.00	17.54	20.23
Chromium	2.02	147.00	46.41	67.53
Cobalt	0.71	5.28	2.65	2.31
Copper	17.40	418.0	205.00	212.64
Iron	8,150	12,900	10763	2092
Lead	20.00	388.0	168	174
Manganese	117.0	364.0	189	117
Mercury	0.03	2.70	1.09	1.29
Nickel	0.85	33.90	14.99	13.77
Selenium	0.13	16.70	8.04	8.83
Silver	0.29	101.00	40.09	48.17
Thallium	3.31	12.50	5.61	4.60
Vanadium	1.69	23.60	11.77	11.73
Zinc	71.70	1,260.00	625	629

Note.—Units of measurement in micrograms per gram (μg/g), which is equal to parts per million.

Source: Montgomery-Watson 1992.

Table 7-76. Ecological Risk Assessment for Adult Waterfowl and Raptors for the SWMU 14 Sewage Lagoons Based on Data from SAIC (1994)

Parameters	Acetone	Arsenic	Bis-2-ethylhexyl phthalate	Benzo(a)anthracene	Barium	Benzyl alcohol	Beryllium	Cadmium	Chromium
Sediment (mg/kg[a])	NA[b]	37	87	2	299	0.043	0.959	40.7	176
H2O[c] (µg/L[d])	59	*1.175*	*3.85*	*4.9*	76.9	*2*	0.56	*3.39*	19.9
BCF[e]	NA	17	NA	12.5	120	NA	10	1387.8	40
Af[f]	1	0.94	0.56	0.3	0.02	NA	0.01	0.1	0.5
Dietd[g] (kg/kg bw/day[h])	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
Dietegl[i] (kg/kg bw/day)	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063
Kel[j]	0.1	0.277	0.5	0.89	0.37	NA	0.0004	0.06	0.0083
aread[k]	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
areae[l]	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
water ing dk[m] (L/kg bw/day[n])	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
water ing egl[o] (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
sed. dk[p] (fraction)	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
Tissue Concentrations									
Cinv[q] (µg/kg[r])	NA	19.98	NA	61.25	9228	NA	5.60	4705	796
Cduck[s] (µg/kg)	NA	0.19	NA	0.05	1.14	NA	0.35	17.81	113.2
Cegl[t] (µg/kg)	NA	0.01	NA	0.0	0.0	NA	0.03	0.07	15.86
Intakes									
Water									
Intaked[u] (mg/kg bw/day[v])	8.41E-04	2.41E-06	7.90E-06	1.01E-05	1.58E-04	4.10E-06	1.15E-06	6.96E-06	4.08E-05
Intakee[w] (mg/kg bw/day)	1.68E-04	1.34E-06	4.39E-06	5.59E-06	8.77E-05	2.28E-06	6.38E-07	3.86E-06	2.27E-05
Sediment									
Intaked (mg/kg bw/day)	NA	6.88E-03	1.62E-02	3.72E-04	5.56E-02	8.00E-06	1.78E-04	7.57E-03	3.27E-02
Diet									
Intaked (mg/kg bw/day)	NA	4.53E-05	NA	1.39E-04	2.09E-02	NA	1.27E-05	1.07E-02	1.81E-03
Intakee (mg/kg bw/day)	NA	3.94E-07	NA	1.07E-07	2.43E-06	NA	7.46E-07	3.79E-05	2.41E-04
Total									
Intaked (mg/kg bw/day)	8.41E-04	6.93E-03	1.62E-02	5.21E-04	7.67E-02	1.21E-05	1.92E-04	1.82E-02	3.46E-02
Intakee (mg/kg bw/day)	1.68E-04	1.73E-06	4.39E-06	5.69E-06	9.01E-05	2.28E-06	1.38E-06	4.17E-05	2.63E-04

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Table 7-76. *Ecological Risk Assessment for Adult Waterfowl and Raptors for the SWMU 14 Sewage Lagoons Based on Data from SAIC (1994) (continued)*

Parameters	Chrysene	Cobalt	Copper	Fluoranthene	Lead	Methyl-n-butyl ketone	Manganese	Mercury	Nickel
Sediment (mg/kg)	2.4	4.98	560	1.8	640	*0.5*	301	5.56	52.8
H2O (µg/L)	*3.7*	*12.5*	*9.4*	*12*	*2.235*	1.7	18.5	*0.05*	*16.05*
BCF	12.5	200	203	12.5	1700	NA	23	15000	100
Af	0.3	0.25	0.5	0.3	0.015	NA	0.035	0.9	0.03
Dietd (kg/kg bw/day)	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
Dietegl (kg/kg bw/day)	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063
Kel	0.89	0.624	0.025	0.89	0.033	NA	0.018	0.0099	0.43
aread	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
areae	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
water ing dk (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
water ing egl (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
sed. dk (fraction)	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
Tissue Concentrations									
Cinv (µg/kg)	46.25	2500	1908	150	3800	NA	425.5	750	1605
Cduck (µg/kg)	0.04	2.28	89.02	0.12	3.97	NA	2.06	154.74	0.26
Cegl (µg/kg)	0.0	0.01	4.0	0.0	0.0	NA	0.05	29.91	0.0
Intakes									
Water									
Intaked (mg/kg bw/day)	7.59E-06	2.57E-05	1.93E-05	2.46E-05	4.59E-06	3.49E-06	3.80E-05	1.03E-07	3.29E-05
Intakee (mg/kg bw/day)	4.22E-06	1.43E-05	1.07E-05	1.37E-05	2.55E-06	1.94E-06	2.11E-05	5.70E-08	1.83E-05
Sediment									
Intaked (mg/kg bw/day)	4.46E-04	9.26E-04	1.04E-01	3.35E-04	1.19E-01	9.30E-05	5.60E-02	1.03E-03	9.82E-03
Diet									
Intaked (mg/kg bw/day)	1.05E-04	5.67E-03	4.33E-03	3.40E-04	8.62E-03	NA	9.65E-04	1.70E-03	3.64E-03
Intakee (mg/kg bw/day)	8.09E-08	4.85E-06	1.89E-04	2.62E-07	8.45E-06	NA	4.38E-06	3.29E-04	5.46E-07
Total									
Intaked (mg/kg bw/day)	5.59E-04	6.62E-03	1.08E-01	7.00E-04	1.28E-01	9.65E-05	5.70E-02	2.74E-03	1.35E-02
Intakee (mg/kg bw/day)	4.30E-06	1.91E-05	2.00E-04	1.39E-05	1.10E-05	1.94E-06	2.55E-05	3.29E-04	1.88E-05

SMU14E S duck,egl 11/19/97

Table 7-76. Ecological Risk Assessment for Adult Waterfowl and Raptors for the SWMU 14 Sewage Lagoons Based on Data from SAIC (1994) (continued)

Parameters	Phenanthrene	Pyrene	Selenium	Silver	1,1,1-Trichloroethane	3-Nitrotoluen	Vanadium	Zinc
Sediment (mg/kg)	4.2	4.9	6.4	133	NA	NA	34.6	1110
H2O (µg/L)	*4.95*	*8.5*	*1.265*	*5*	2	21	*13.8*	*9*
BCF	12.5	12.5	167	36	NA	NA	3000	1130
Af	0.3	0.3	1	0.1	NA	NA	0.1	0.5
Dietd (kg/kg bw/day)	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
Dietegl (kg/kg bw/day)	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063
Kel	0.89	0.89	0.0099	0.289	NA	NA	0.19	0.01
aread	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
areae	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
water ing dk (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
water ing egl (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
sed. dk (fraction)	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
Tissue Concentrations								
Cinv (µg/kg)	61.88	106.3	211.3	180	NA	NA	41400	10170
Cduck (µg/kg)	0.05	0.09	48.78	0.15	NA	NA	49.44	1164.52
Cegl (µg/kg)	0.0	0.0	10.62	0.0	NA	NA	0.06	124.30
Intakes								
Water								
Intaked (mg/kg bw/day)	1.02E-05	1.74E-05	2.60E-06	1.03E-05	4.10E-06	4.31E-05	2.83E-05	1.85E-05
Intakee (mg/kg bw/day)	5.64E-06	9.69E-06	1.44E-06	5.70E-06	2.28E-06	2.39E-05	1.57E-05	1.03E-05
Sediment								
Intaked (mg/kg bw/day)	7.81E-04	9.11E-04	1.19E-03	2.47E-02	NA	NA	6.43E-03	2.06E-01
Diet								
Intaked (mg/kg bw/day)	1.40E-04	2.41E-04	4.79E-04	4.08E-04	NA	NA	9.39E-02	2.31E-02
Intakee (mg/kg bw/day)	1.08E-07	1.86E-07	1.04E-04	3.26E-07	NA	NA	1.05E-04	2.48E-03
Total								
Intaked (mg/kg bw/day)	9.32E-04	1.17E-03	1.67E-03	2.52E-02	4.10E-06	4.31E-05	1.00E-01	2.30E-01
Intakee (mg/kg bw/day)	5.75E-06	9.88E-06	1.05E-04	6.03E-06	2.28E-06	2.39E-05	1.21E-04	2.49E-03

Note.—Data are maximum values. Italics indicate CRL/2.

[a]Milligrams per kilogram.
[b]Not available or not applicable.
[c]Water.
[d]Micrograms per liter.
[e]Bioconcentration factor.
[f]Assimilation efficiency.
[g]Diet—duck.
[h]Kilograms per kilogram body weight per day.
[i]Diet—eagle.
[j]Elimination rate.
[k]Area—duck.
[l]Area—eagle.
[m]Water ingestion—duck.
[n]Liters per kilogram body weight per day.
[o]Water ingestion—eagle.
[p]Sediment—duck.
[q]Concentration—invertebrate.
[r]Micrograms per kilogram.
[s]Concentration—duck.
[t]Concentration—eagle.
[u]Intake—duck.
[v]Milligrams per kilogram body weight per day.
[w]Intake—eagle.

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Table 7-77. Ecological Risk Assessment for Ducklings and Shorebirds for the SWMU 14 Sewage Lagoons Based on Data from SAIC (1994)

Parameters	Acetone	Arsenic	Bis-2-ethylhexyl phthalate	Benzo(a)anthracene	Barium	Benzyl alcohol	Beryllium	Cadmium	Chromium
Sediment (mg/kg[a])	NA[b]	37	87	2	299	0.043	0.959	40.7	176
H2O[c] (µg/L[d])	59	*1.175*	*3.85*	*4.9*	*76.9*	*2*	*0.56*	*3.39*	19.9
BCF[e]	NA	17	NA	12.5	120	NA	10	1387.8	40
Af[f]	1	0.94	0.56	0.3	0.02	NA	0.01	0.1	0.5
Dietdklng[g] (kg/kg bw/day[h])	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Dietsb[i](kg/kg bw/day)	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173
Kel[j]	0.1	0.277	0.5	0.89	0.37	NA	0.0004	0.06	0.0083
areadklng[k]	1	1	1	1	1	1	1	1	1
areasb[l]	1	1	1	1	1	1	1	1	1
water ing dklng[m] (L/kg bw/day[n])	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
water ing sb[o] (L/kg bw/day)	0.165	0.165	0.165	0.165	0.165	0.165	0.165	0.165	0.165
sed. dklng[p] (fraction)	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
sed. sb[q] (fraction)	N/A	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181
Tissue Concentrations									
Cinv[r](µg/kg[s])	N/A	19.98	NA	61.25	9228	NA	5.60	4705	796
Cdklng[t] (µg/kg)	N/A	11.94	NA	3.20	75.26	NA	22.09	1177	7392
Csb[u] (µg/kg)	N/A	16.32	NA	3.87	87.49	NA	27.28	1360	8825
Intakes									
Water									
Intakedklng[v] (mg/kg bw/day[w])	8.41E-04	6.70E-05	2.19E-04	2.79E-04	4.38E-03	1.14E-04	3.19E-05	1.93E-04	1.13E-03
Intakesb[x] (mg/kg bw/day)	1.68E-04	1.94E-04	6.35E-04	8.09E-04	1.27E-02	3.30E-04	9.24E-05	5.59E-04	3.28E-03
Sediment									
Intakedklng (mg/kg bw/day)	N/A	4.55E-01	1.07E+00	2.46E-02	3.68E+00	5.29E-04	1.18E-02	5.01E-01	2.16E+00
Intakesb (mg/kg bw/day)		1.16E+00	2.72E+00	6.26E-02	9.36E+00	1.35E-03	3.00E-02	1.27E+00	5.51E+00
Diet									
Intakedklng (mg/kg bw/day)	N/A	3.00E-03	NA	9.19E-03	1.38E+00	NA	8.40E-04	7.06E-01	1.19E-01
Intakesb (mg/kg bw/day)	N/A	3.46E-03	NA	1.06E-02	1.60E+00	NA	9.69E-04	8.14E-01	1.38E-01
Total									
Intakedklng (mg/kg bw/day)	8.41E-04	0.46	1.07	0.03	5.07	6.43E-04	0.01	1.21	2.29
Intakesb (mg/kg bw/day)	1.68E-04	1.16	2.72	0.07	10.97	1.68E-03	0.03	2.09	5.65

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Table 7-77. *Ecological Risk Assessment for Ducklings and Shorebirds for the SWMU 14 Sewage Lagoons Based on Data from SAIC (1994) (continued)*

Parameters	Chrysene	Cobalt	Copper	Fluoranthene	Lead	Methyl-n-butyl ketone	Manganese	Mercury	Nickel
Sediment (mg/kg)	2.4	4.98	560	1.8	640	0.5	301	5.56	52.8
H2O (µg/L)	*3.7*	*12.5*	*9.4*	*12*	*2.235*	1.7	18.5	*0.05*	*16.05*
BCF	12.5	200	203	12.5	1700	NA	23	15000	100
Af	0.3	0.25	0.5	0.3	0.015	NA	NA	0.9	0.03
Dietdking (kg/kg bw/day)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Dietsb (kg/kg bw/day)	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173
Kel	0.89	0.624	0.025	0.89	0.033	NA	NA	0.0099	0.43
areadking	1	1	1	1	1	1	1	1	1
areasb	1	1	1	1	1	1	1	1	1
water ing dking (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
water ing sb (L/kg bw/day)	0.165	0.165	0.165	0.165	0.165	0.165	0.165	0.165	0.165
sed. dking (fraction)	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
sed. sb (fraction)	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181
Tissue Concentrations									
Cinv (µg/kg)	46.25	2500	1908	150	3800	NA	426	750	1605
Cdking (µg/kg)	2.42	151	5873	7.82	263	NA	NA	10234	16.91
Csb (µg/kg)	2.93	174	6984	9.43	308	NA	NA	11812	19.67
Intakes									
Water									
Intakedking (mg/kg bw/day)	2.11E-04	7.13E-04	5.36E-04	6.84E-04	1.27E-04	9.69E-05	1.05E-03	2.85E-06	9.15E-04
Intakesb (mg/kg bw/day)	6.11E-04	2.06E-03	1.55E-03	1.98E-03	3.69E-04	2.81E-04	3.05E-03	8.25E-06	2.65E-03
Sediment									
Intakedking (mg/kg bw/day)	2.95E-02	6.13E-02	6.89E+00	2.21E-02	7.87E+00	6.15E-03	3.70E+00	6.84E-02	6.49E-01
Intakesb (mg/kg bw/day)	7.52E-02	1.56E-01	1.75E+01	5.64E-02	2.00E+01	1.57E-02	9.43E+00	1.74E-01	1.65E+00
Diet									
Intakedking (mg/kg bw/day)	6.94E-03	3.75E-01	2.86E-01	2.25E-02	5.70E-01	NA	6.38E-02	1.13E-01	2.41E-01
Intakesb (mg/kg bw/day)	8.00E-03	4.33E-01	3.30E-01	2.60E-02	6.57E-01	NA	7.36E-02	1.30E-01	2.78E-01
Total									
Intakedking (mg/kg bw/day)	0.04	0.44	7.17	0.05	8.44	0.01	3.77	0.18	0.89
Intakesb (mg/kg bw/day)	0.08	0.59	17.87	0.08	20.70	0.02	9.50	0.30	1.93

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Table 7-77. Ecological Risk Assessment for Ducklings and Shorebirds for the SWMU 14 Sewage Lagoons Based on Data from SAIC (1994) (continued)

Parameters	Phenanthrene	Pyrene	Selenium	Silver	1,1,1-Trichloroethane	3-Nitrotoluene	Vanadium	Zinc
Sediment (mg/kg)	4.2	4.9	6.4	133	NA	NA	34.6	1110
H2O (μg/L)	*4.95*	*8.5*	*1.265*	*5*	2	21	*13.8*	*9*
BCF	12.5	12.5	167	36	NA	NA	3000	1130
Af	0.3	0.3	1	0.1	NA	NA	0.1	0.5
Dietdking (kg/kg bw/day)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Dietsb (kg/kg bw/day)	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173
Kel	0.89	0.89	0.0099	0.289	NA	NA	0.19	0.01
areadking	1	1	1	1	1	1	1	1
areasb	1	1	1	1	1	1	1	1
water ing dking (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
water ing sb (L/kg bw/day)	0.165	0.165	0.165	0.165	0.165	0.165	0.165	0.165
sed. dking (fraction)	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
sed. sb (fraction)	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181
Tissue Concentrations								
Cinv (μg/kg)	61.88	106	211	180	NA	NA	41400	10170
Cdking (μg/kg)	3.24	5.56	3216	10.01	NA	NA	3269	76983
Csb (μg/kg)	3.93	6.72	3733	12.50	NA	NA	3771	89783
Intakes								
Water								
Intakedking (mg/kg bw/day)	2.82E-04	4.85E-04	7.21E-05	2.85E-04	1.14E-04	1.20E-03	7.87E-04	5.13E-04
Intakesb (mg/kg bw/day)	8.17E-04	1.40E-03	2.09E-04	8.25E-04	3.30E-04	3.47E-03	2.28E-03	1.49E-03
Sediment								
Intakedking (mg/kg bw/day)	5.17E-02	6.03E-02	7.87E-02	1.64E+00	NA	NA	4.26E-01	1.37E+01
Intakesb (mg/kg bw/day)	1.32E-01	1.53E-01	2.00E-01	4.16E+00	NA	NA	1.08E+00	3.48E+01
Diet								
Intakedking (mg/kg bw/day)	9.28E-03	1.59E-02	3.17E-02	2.70E-02	NA	NA	6.21E+00	1.53E+00
Intakesb (mg/kg bw/day)	1.07E-02	1.84E-02	3.65E-02	3.11E-02	NA	NA	7.16E+00	1.76E+00
Total								
Intakedking (mg/kg bw/day)	0.06	0.08	0.11	1.66	0.00	0.00	6.64	15.18
Intakesb (mg/kg bw/day)	0.14	0.17	0.24	4.20	0.00	0.00	8.25	36.52

Note.—Data are maximum values. Italics indicate CRL/2.

[a]Milligrams per kilogram.
[b]Not available or not applicable.
[c]Water.
[d]Micrograms per liter.
[e]Bioconcentration factor.
[f]Assimilation efficiency.
[g]Diet—duckling.
[h]Kilograms per kilogram body weight per day.
[i]Diet—shorebird.
[j]Elimination rate.
[k]Area—duckling.
[l]Area—shorebird.
[m]Water ingestion—duckling.
[n]Liters per kilogram body weight per day.
[o]Water ingestion—shorebird.
[p]Sediment—duckling.
[q]Sediment—shorebird.
[r]Concentration—invertebrate.
[s]Micrograms per kilogram.
[t]Concentration—duckling.
[u]Concentration—shorebird.
[v]Intake—duckling.
[w]Milligrams per kilogram body weight per day.
[x]Intake—shorebird.

SMU14ERA.XLS duckling,sb 11/19/97

Table 7-78. Ecological Risk Assessment for Adult Waterfowl and Raptors for the SWMU 14 Sewage Lagoons Based on Data from Montgomery Watson (1992)

Parameters	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganes	Mercury	Nickel	Selenium
Sediment (mg/kg[a])	33.6	360	1.17	42	147	5.28	418	12,900	388	364	2.7	33.9	16.7
H2O[b] (µg/L[c])	3.3	64	*2.5*	*2*	*3*	*12.5*	*4*	88.7	3.58	24.7	*0.12*	*17.15*	*1.5*
BCF[d]	17	120	10	1,388	40	200	203	190	1700	23	15,000	100	167
Af[e]	0.94	0.02	0.01	0.1	0.5	0.25	0.5	0.2	0.015	0.035	0.9	0.03	1
Dietdk[f](kg/kg bw/day[g])	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
Dietegl[h] (kg/kg bw/day)	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063	0.1063
Kel[i]	0.277	0.37	0.0004	0.06	0.0083	0.624	0.025	0.02	0.033	0.018	0.0099	0.43	0.0099
aread[k]	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
areae[l])	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
water ing dk[m] (L/kg bw/day[n])	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
water ing egl[o] (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
sed. dk[p] (fraction)	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
Tissue Concentrations													
Cinv[q] (µg/kg)[r]	56.1	7,680	25	2,776	120	2,500	812	16,853	6,086	568.1	1800	1715	250.5
Cduck[s] (µg/kg)	0.48	0.95	1.55	10.51	18.41	2.28	38.55	408.04	6.31	2.74	371.20	0.27	58.01
Cegl[t] (µg/kg)	0.02	0.00	0.15	0.04	2.56	0.01	1.73	9.69	0.01	0.07	71.75	0.00	12.63
Intakes													
Water													
Intaked[u] (mg/kg bw/day[v])	6.7716E-06	1.31E-04	5.13E-06	4.10E-06	6.16E-06	2.57E-05	8.21E-06	1.82E-04	7.35E-06	5.07E-05	2.46E-07	3.52E-05	3.08E-06
Intakee[w] (mg/kg bw/day)	3.76E-06	7.30E-05	2.85E-06	2.28E-06	3.42E-06	1.43E-05	4.56E-06	1.01E-04	4.08E-06	2.82E-05	1.37E-07	1.96E-05	1.71E-06
Sediment													
Intaked (mg/kg bw/day)	6.25E-03	6.70E-02	2.18E-04	7.81E-03	2.73E-02	9.82E-04	7.77E-02	2.40E+00	7.22E-02	6.77E-02	5.02E-04	6.30E-03	3.11E-03
Diet													
Intaked (mg/kg bw/day)	1.27E-04	1.74E-02	5.67E-05	6.30E-03	2.72E-04	5.67E-03	1.84E-03	3.82E-02	1.38E-02	1.29E-03	4.08E-03	3.89E-03	5.68E-04
Intakee (mg/kg bw/day)	1.0119E-06	2.0245E-06	3.29783E-06	2.23477E-05	3.91459E-05	4.85218E-06	8.19599E-05	8.67E-04	1.34156E-05	5.81568E-06	7.89E-04	5.8309E-07	1.23E-04
Total													
Intaked (mg/kg bw/day)	6.38E-03	8.45E-02	2.79E-04	1.41E-02	2.76E-02	6.68E-03	7.96E-02	2.44E+00	8.60E-02	6.90E-02	4.58E-03	1.02E-02	3.68E-03
Intakee (mg/kg bw/day)	4.77E-06	7.50E-05	6.15E-06	2.46E-05	4.26E-05	1.91E-05	8.65E-05	9.69E-04	1.75E-05	3.40E-05	7.89E-04	2.01E-05	1.25E-04

SMU14MW.XLSduck,egl11/19/97

Table 7-78. Ecological Risk Assessment for Adult Waterfowl and Raptors for the SWMU 14 Sewage Lagoons Based on Data from Montgomery Watson (1992) (continued)

Parameters	Silver	Thallium	Vanadium	Zinc	Chloroform
Sediment (mg/kg)	101	12.5	23.6	1,260	ND
H2O(µg/L)	*2.3*	*3.495*	*5.5*	*10.55*	0.62
BCF	36	NA	3,000	1,130	NA
Af	0.1	NA	0.1	0.5	NA
Dietdk (kg/kg bw/day)	0.063	0.063	0.063	0.063	0.063
Dietegl (kg/kg bw/day)	0.1063	0.1063	0.1063	0.1063	0.1063
Kel	0.289	NA	0.19	0.01	0.02
aread	0.036	0.036	0.036	0.036	0.036
areae	0.02	0.02	0.02	0.02	0.02
water ing dk (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057
water ing egl (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057
sed. dk (fraction)	0.082	0.082	0.082	0.082	0.082
Tissue Concentrations					
Cinv (µg/kg)	82.8	NA	16,500	11,922	NA
Cduck (µg/kg)	0.07	NA	19.70	1,365	NA
Cegl (µg/kg)	0.00	NA	0.03	145.67	NA
Intakes					
Water					
Intaked (mg/kg bw/day)	4.72E-06	7.17E-06	1.13E-05	2.16E-05	1.27E-06
Intakee (mg/kg bw/day)	2.62E-06	3.98E-06	6.27E-06	1.20E-05	7.07E-07
Sediment					
Intaked (mg/kg bw/day)	1.88E-02	2.32E-03	4.39E-03	2.34E-01	N/A
Diet					
Intaked (mg/kg bw/day)	1.88E-04	NA	3.74E-02	2.70E-02	N/A
Intakee (mg/kg bw/day)	1.55436E-07	NA	4.18908E-05	2.90E-03	N/A
Total					
Intaked (mg/kg bw/day)	1.90E-02	2.33E-03	4.18E-02	2.61E-01	1.27E-06
Intakee (mg/kg bw/day)	2.78E-06	3.98E-06	4.82E-05	2.91E-03	7.07E-07

Note.—Data are maximum values. Italics indicate CRL/2.
[a]Milligrams per kilogram.
[b]Water.
[c]Micrograms per liter.
[d]Bioconcentration factor.
[e]Assimilation efficiency.
[f]Diet—duck.
[g]Kilograms per kilogram body weight per day.
[h]Diet—eagle.
[i]Elimination rate.
[j]Not available or not applicable.
[k]Area—duck.
[l]Area—eagle.
[m]Water ingestion—duck.
[n]Liters per kilogram body weight per day.
[o]Water ingestion—eagle.
[p]Sediment—duck.
[q]Concentration—invertebrate.
[r]Micrograms per kilogram.
[s]Concentration—duck.
[t]Concentration—eagle.
[u]Intake—duck.
[v]Milligrams per kilogram body weight per day.
[w]Intake—eagle.

SMU14M duck,egl11/19/97

Table 7-79. *Ecological Risk Assessment for Ducklings and Shorebirds for the SWMU 14 Sewage Lagoons Based on Data from Montgomery Watson (1992)*

Parameters	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead
Sediment (mg/kg[a])	33.6	360	1.17	42	147	5.28	418	12,900	388
H2O[b] (µg/L[c])	3.3	64	*2.5*	*2*	*3*	*12.5*	*4*	88.7	3.58
BCF[d]	17	120	10	1,388	40	200	203	190	1,700
Af[e]	0.94	0.02	0.01	0.1	0.5	0.25	0.5	0.2	0.015
Dietdklng[f] (kg/kg bw/day[g])	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Dietsb[h] (kg/kg bw/day)	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173
Kel[i]	0.277	0.37	0.0004	0.06	0.0083	0.624	0.025	0.02	0.033
areadklng[k]	1	1	1	1	1	1	1	1	1
areasb[l]	1	1	1	1	1	1	1	1	1
water ing dklng[m] (L/kg bw/day[n])	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
water ing sb[o] (L/kg bw/day)	0.165	0.165	0.165	0.165	0.165	0.165	0.165	0.165	0.165
sed. dklng[p](fraction)	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
sed. sb[q] (fraction)	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181
Tissue Concentrations									
Cinv[r] (µg/kg[s])	56.1	7680	25	2,776	120	2,500	812	16,853	6,086
Cdklng[t] (µg/kg)	30.60	62.71	97.67	694.95	1,204	150.55	2,543	26,917	417.22
Csb[u] (µg/kg)	38.35	73.00	119.35	803.04	1,558	174.17	3,084	33,341	484.37
Intakes									
Water									
Intakedklng[v] (mg/kg bw/day[w])	1.88E-04	3.65E-03	1.43E-04	1.14E-04	1.71E-04	7.13E-04	2.28E-04	5.06E-03	2.04E-04
Intakesb[x] (mg/kg bw/day)	5.45E-04	1.06E-02	4.13E-04	3.30E-04	4.95E-04	2.06E-03	6.60E-04	1.46E-02	5.91E-04
Sediment									
Intakedklng (mg/kg bw/day)	0.41328	4.43E+00	1.44E-02	5.17E-01	1.81E+00	6.49E-02	5.14E+00	1.59E+02	4.77E+00
Intakesb (mg/kg bw/day)	1.05E+00	1.13E+01	3.66E-02	1.32E+00	4.60E+00	1.65E-01	1.31E+01	4.04E+02	1.21E+01
Diet									
Intakedklng (mg/kg bw/day)	8.42E-03	1.15E+00	3.75E-03	4.16E-01	1.80E-02	3.75E-01	1.22E-01	2.53E+00	9.13E-01
Intakesb (mg/kg bw/day)	9.71E-03	1.33E+00	4.33E-03	4.80E-01	2.08E-02	4.33E-01	1.40E-01	2.92E+00	1.05E+00
Total									
Intakedklng (mg/kg bw/day)	4.22E-01	5.58E+00	1.83E-02	9.33E-01	1.83E+00	4.41E-01	5.26E+00	1.61E+02	5.69E+00
Intakesb (mg/kg bw/day)	1.06E+00	1.26E+01	4.14E-02	1.80E+00	4.62E+00	6.00E-01	1.32E+01	4.07E+02	1.32E+01

SMU14MW.XLSdklng,sb11/19/97

Table 7-79. *Ecological Risk Assessment for Ducklings and Shorebirds for the SWMU 14 Sewage Lagoons Based on Data from Montgomery Watson (1992) (continued)*

Parameters	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Chloroform
Sediment (mg/kg)	364	2.7	33.9	16.7	101	12.5	23.6	1260	ND
H2O (µg/L)	24.7	*0.12*	*17.15*	*1.5*	*2.3*	*3.495*	*5.5*	*10.55*	0.62
BCF	23	15000	100	167	36	NA	3000	1130	NA
Af	0.035	0.9	0.03	1	0.1	NA	0.1	0.5	NA
Dietdklng (kg/kg bw/day)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Dietsb (kg/kg bw/day)	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173
Kel	0.018	0.0099	0.43	0.0099	0.289	NA	0.19	0.01	0.02
areadklng	1	1	1	1	1	1	1	1	1
areasb	1	1	1	1	1	1	1	1	1
water ing dklng (L/kg bw/day)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
water ing sb (L/kg bw/day)	0.165	0.165	0.165	0.165	0.165	0.165	0.165	0.165	0.165
sed. dklng(fraction)	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
sed. sb(fraction)	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181
Tissue Concentrations									
Cinv (µg/kg)	568.1	1800	1715	250.5	82.8	NA	16500	11921.5	NA
Cdklng (µg/kg)	177.14	24549.10	18.04	3824.84	4.77	NA	1302.95	90216.22	NA
Csb (µg/kg)	221.19	28318.58	20.97	4455.25	6.18	NA	1503.23	105180.73	NA
Intakes									
Water									
Intakedklng (mg/kg bw/day)	1.41E-03	6.84E-06	9.78E-04	8.55E-05	1.31E-04	1.99E-04	3.14E-04	6.01E-04	3.53E-05
Intakesb(mg/kg bw/day)	4.08E-03	1.98E-05	2.83E-03	2.48E-04	3.80E-04	5.77E-04	9.08E-04	1.74E-03	1.02E-04
Sediment									
Intakedklng (mg/kg bw/day)	4.48E+00	3.32E-02	4.17E-01	2.05E-01	1.24E+00	1.54E-01	2.90E-01	1.55E+01	NA
Intakesb (mg/kg bw/day)	1.14E+01	8.45E-02	1.06E+00	5.23E-01	3.16E+00	3.91E-01	7.39E-01	3.95E+01	NA
Diet									
Intakedklng (mg/kg bw/day)	8.52E-02	2.70E-01	2.57E-01	3.76E-02	1.24E-02	NA	2.48E+00	1.79E+00	NA
Intakesb (mg/kg bw/day)	9.83E-02	3.11E-01	2.97E-01	4.33E-02	1.43E-02	NA	2.85E+00	2.06E+00	NA
Total									
Intakedklng (mg/kg bw/day)	4.56E+00	3.03E-01	6.75E-01	2.43E-01	1.25E+00	1.54E-01	2.77E+00	1.73E+01	3.53E-05
Intakesb (mg/kg bw/day)	1.15E+01	3.96E-01	1.36E+00	5.67E-01	3.18E+00	3.92E-01	3.59E+00	4.15E+01	1.02E-04

Note.—Data are maximum values. Italics indicate CRL/2.

[a]Milligrams per kilogram.
[b]Water.
[c]Micrograms per liter.
[d]Bioconcentration factor.
[e]Assimilation efficiency.
[f]Diet—duckling.
[g]kg/kg bw/day = Kilograms per kilogram body weight per day.
[h]Diet—shorebird.
[i]Elimination rate.
[j]Not available or not applicable.
[k]Area—duckling.
[l]Area—shorebird.
[m]Water ingestion—duckling.
[n]Liters per kilogram body weight per day.
[o]Water ingestion—shorebird.
[p]Sediment—duckling.
[q]Sediment—shorebird.
[r]Concentration—invertebrate.
[s]Micrograms per kilogram.
[t]Concentration—duckling.
[u]Concentration—shorebird.
[v]Intake—duckling.
[w]Milligrams per kilogram body weight per day.
[x]Intake—shorebird.

SMU14M[illegible]dklng,sb11/19/97

Table 7-80. Taxon-specific Parameters Used to Calculate Exposure Intakes

Parameter	Shorebird	Duck	Duckling	Eagle	Source
AUF[a]	1	0.036	1	0.02	USEPA[b] 1993a; Preston and Beane 1993
Ingestion rate - water (L/kg bw/day)[c]	0.165	0.057	0.057	0.057	USEPA 1993a
Ingestion rate - diet (kg/kg bw/day)[d]	0.173	0.063	0.15	0.1063	USEPA 1993a; Preston and Beane 1993
Fraction soil	0.181	0.082	0.082	NA	Beyer et al. 1994

[a] Area use factor.
[b] U.S. Environmental Protection Agency.
[c] Liters per kilogram body weight per day.
[d] Kilograms per kilogram body weight per day.

Table 7-81. Hazard Quotients/Hazard Indices for Maximum Exposure Point Concentrations for Avian Receptors at SWMU 14 (SAIC 1994)

Analyte	Duck	Duckling	Shorebird	Eagle
Acetone	NA[a]	NA	NA	NA
Arsenic	0.00049	0.033	0.415	1.24E-06
Bis-2-ethylhexyl phthalate	0.00778	0.515	1.310	4.22E-06
Benzo(a)anthracene	NA	NA	NA	NA
Barium	0.00395	0.261	0.566	9.29E-06
Benzyl alcohol	NA	NA	NA	NA
Beryllium	0.00001	0.001	0.002	1.43E-07
Cadmium	0.027	1.801	16.068	5.96E-04
Chromium	0.133	8.790	17.663	2.03E-03
Chrysene	NA	NA	NA	NA
Cobalt	0.00002	0.001	0.004	2.27E-07
Copper	0.010	0.649	1.615	3.62E-05
Fluoranthene	NA	NA	NA	NA
Lead	0.044	2.911	7.137	6.07E-06
Methyl-n-butyl ketone	NA	NA	NA	NA
Manganese	0.001	0.046	0.116	6.21E-07
Mercury	0.005	0.362	0.608	1.32E-03
Nickel	0.002	0.153	0.332	6.48E-06
Phenanthrene	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA
Selenium	0.013	0.850	1.824	1.50E-03
Silver	0.010	0.668	1.685	4.82E-06
1,1,1-Trichloroethane	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA
Zinc	0.009	0.562	6.763	9.21E-04
Total HIs[b]	0.3	17.6	56.1	0.006

[a]Toxicity data not available.

[b]Hazard indices.

Table 7-82. Hazard Quotients/Hazard Indices for Maximum Exposure Point Concentrations for Avian Receptors at SWMU 14 (Montgomery Watson 1992)

Analyte	Duck	Duckling	Shorebird	Eagle
Arsenic	0.00046	0.030	0.379	3.41E-06
Barium	0.00436	0.288	0.650	7.73E-06
Beryllium	0.00001	0.001	0.002	6.34E-07
Cadmium	0.021	1.393	13.813	3.52E-04
Chloroform	NA[a]	NA	NA	NA
Chromium	0.106	7.024	14.451	3.27E-04
Cobalt	0.00002	0.001	0.004	2.27E-07
Copper	0.007	0.476	1.196	1.56E-05
Iron	0.031	2.067	5.216	2.48E-05
Lead	0.030	1.961	4.553	9.67E-06
Manganese	0.001	0.056	0.140	8.29E-07
Mercury	0.009	0.606	0.792	3.16E-03
Nickel	0.002	0.116	0.234	6.92E-06
Selenium	0.028	1.870	4.358	1.79E-03
Silver	0.008	0.504	1.276	2.22E-06
Thallium	0.047	3.079	7.840	1.99E-04
Vanadium	NA	NA	NA	NA
Zinc	0.010	0.640	7.689	1.08E-03
Total HIs[(b)]	**0.3**	**20.1**	**62.6**	**0.007**

[a]Toxicity data not available.

[b]Hazard Indices.

Table 7-83. Conservative Assumptions and Parameters Incorporated into the SWERA

Assumption/Parameter	Where Applied	Result	Comment
Birds and mammals were assumed to spend 100% of time on TEAD; seasonal migration was not considered.	Calculation of exposure intakes.	HQs[a] and HIs[b] are biased high and therefore conservative and protective of ecological receptors since most birds and mammals typically do not spend 100% of time on TEAD.	
Biased co-located soil and vegetation sampling design focused on areas of known and higher contamination.	Calculation of exposure intakes for all receptors for dietary and soil exposure pathways.	Cterms (or EPCs) and resultant HQs and HIs are biased high, and therefore conservative and protective of all ecological receptors.	
Ingestion of surface water by TEAD ecological receptors was assumed to occur.	Calculation of exposure intakes for birds and mammals (except for deer mice) for ingestion of surface water.	HQs and HIs are biased high and therefore conservative and protective of ecological receptors (except for the deer mouse).	Surface water data are very limited and are applied to risk calculations as though being a source at all times; in actuality, most of the surface water data is a result of intermittent periods of precipitation and does not represent a continual water supply. It is also probable that other ecological receptors don't drink surface water, or they obtain water from sources not on TEAD.
"Worst-case" concentrations were used for dioxin/furan concentrations in jackrabbits at SWMUs within ESA-1[c] and ESA-2 where no specific dioxin/furan model was developed and/or no actual dioxin/furan in jackrabbit analytical data exist.	Calculation of exposure intakes for ecological receptors ingesting jackrabbit containing dioxins/furans (passerine birds, American kestrel, great horned owl, golden eagle, bald eagle, and kit fox).	HQs and HIs are biased high and therefore conservative and protective of receptors ingesting jackrabbit containing dioxins and furans.	Cterm[d] values represent a "worst case" scenario based upon highest detected soil concentrations and highest biota concentrations using TCDD[e] (most toxic of dioxins/furans). In addition, all congeners of dioxins and furans (SW-846[f] list) were assumed to be present when, in all probability, only a few are likely to be present based upon soil detections.
2,4-D[g] concentrations in receptors at SWMUs[h] with no invertebrate or jackrabbit data were used to derive Cterms for dietary ingestion.	Calculation of exposure intakes for ecological receptors ingesting jackrabbit and beetles and/or grasshoppers (all receptors except jackrabbit, mule deer, plants and soil fauna).	HQs and HIs are biased high and therefore conservative and protective of receptors ingesting jackrabbits and invertebrates containing 2,4-D.	2,4-D is expected to metabolize rapidly in mammalian and invertebrate systems. It is also not expected to persist in the environment for more than a few days (Howard 1991). Therefore, its presence is unlikely and its impact on these receptors should be insignificant.
Protective concentrations were used for ppDDE[i] and ppDDT[j] in receptors at SWMUs with no jackrabbit data.	Calculation of exposure intakes for ecological receptors ingesting jackrabbit containing DDE and/or DDT.	HQs and HIs are biased high and therefore conservative and protective of receptors ingesting jackrabbits or small mammals containing DDE or DDT.	Model output for Cterm values for DDT was based all on non-detects in jackrabbit. Model output for DDE was based on few detects in jackrabbit tissue, 1/15 at the RSA[k], and 3/15 at SWMU 45.

Table 7-83. Conservative Assumptions and Parameters Incorporated into the SWERA (continued)

Assumption/Parameter	Where Applied	Result	Comment
Explosive concentrations (246TNT[f], RDX[m]) in grasshoppers and beetles were used to derive Cterms for dietary ingestion.	Calculation of exposure intakes for ecological receptors ingesting grasshoppers and beetles.	HQs and HIs are biased high and therefore conservative and protective of receptors ingesting grasshoppers and beetles.	246TNT and RDX are expected to metabolize in invertebrates and should not be present.
Protective concentrations were used for PAH in jackrabbits at SWMUs with no jackrabbit data.	Calculation of exposure intakes for ecological receptors ingesting jackrabbit or small mammal carcass.	HQs and HIs are biased high and therefore highly conservative and protective of receptors ingesting jackrabbit or small mammals.	Highest detected PAH in jackrabbit (pyrene at SWMU 45) was used for Cterm values for jackrabbits at SWMUs other than 45 and the RSA. In reality, these compounds are likely metabolized in mammalian systems.
Use of NOAELs[c] for TBVs[b].	Calculation of final TBVs for use in calculating exposure intakes.	HQs and HIs are biased high and therefore highly conservative and protective of receptors.	NOAELs are rather abstract endpoints; adverse population effects may not occur until much higher levels of exposure are reached.
Use of 95th percentile exposure parameters.	Calculation of exposure intakes for ecological receptors for all exposure pathways (except plants, soil fauna, and air inhalation).	HQs and HIs are biased high and therefore highly conservative and protective of avian and mammalian receptors.	Use of 95th percentile is more conservative than either the UCL95[d] or mean values.
AUFs[e] not incorporated into risk calculations for surface water.	Calculation of exposure intakes for ecological receptors ingesting surface water for all receptors except the deer mouse, plants, and soil fauna.	HQs and HIs are biased high and therefore conservative and protective of avian and mammalian receptors ingesting surface water.	By not using an AUF in the risk calculations, the risks assume that the receptor is taking all surface water from the most contaminated locations and that all surface water ingested is contaminated.
Terrestrial Bioaccumulation Model.	Calculation of all modeled Cterm values.	HQs and HIs based on modeled Cterm values are biased high and therefore conservative, and protective of avian and mammalian receptors ingesting dietary components.	Model was developed and calibrated to overpredict risk.
The highest TEAD HIs, based on either TEAD historic or TEAD current (SWMU basis) data sets, were used for comparison of TEAD to the RSA.	SWERA conclusions, and recommendations Table 7-86.	Conclusions are conservative based upon "worst case" values which are primarily due to the HIs calculated for the TEAD historic data set.	In the absence of both data sets (TEAD historical and TEAD current on a SWMU basis), all conclusions/recommendations would have been based on TEAD current data (SWMU basis) which were typically less than the HIs calculated on the TEAD historical data set.

Table 7-83. Conservative Assumptions and Parameters Incorporated into the SWERA (continued)

Assumption/Parameter	Where Applied	Result	Comment
All COPCs were summed across all exposure pathways for ecological receptors.	Calculation of HIs for ecological receptors for all pathways.	HIs are likely conservative since biological interactions such as synergism and antagonism were not considered.	The summation of all COPCs across all pathways is conservative in that the presence of some metals, for example, may ameliorate the toxicity of others.
For several COPCs in the current soil and biota data, HQs were calculated on nondetects (See Appendix I).	Calculation of Cterms, exposure intakes, HQs, and HIs for ecological receptors for soil ingestion and dietary pathways (current data on both SWMU and ESA basis).	HIs for ESA SWMUs and ESAs are more conservative than if co-located soil and biota had been compared to background and 5% detection frequency as had TEAD historic data set.	

[a]Hazard quotients.
[b]Hazard indices.
[c]Ecological study area.
[d]Concentration term.
[e]Tetrachlorodibenzodioxins.
[f]EPA manual, "Test Methods for Evaluating Solid Waste."
[g]2,4-Dichlorophenoxyacetic acid.
[h]Solid waste management unit.
[i]p,p'-Dichlorodiphenyldichloroethene.
[j]p,p'-Dichlorodiphenyltrichloroethane.
[k]Reference study area.
[l]2,4,6-Trinitrotoluene.
[m]RDX (Cyclonite).
[n]Polynuclear aromatic hydrocarbons.
[o]No observed adverse effects level.
[p]Toxicity benchmark value.
[q]Upper 95th % confidence level.
[r]Area use factor.

Table 7-84. Exploratory Statistics for Vegetation and Small Mammal Data

Variable	KS[a] Test Statistic	Distribution	Required Sample Size[b]	Required Sample Size [c]
Small mammal density	0.182	Normal	2 (assumed σ = 2.5) *	1 (σ = 2.5)
Bare ground	0.978	Normal	77 (σ = 8.2)	17 (σ = 8.2)
B. tectorum[d]	0.873	Normal	41 (σ = 12.89)	11 (σ = 12.89)
Litter	0.999	Normal	8 (σ = 6.6)	2 (σ = 6.6)
Poa spp.[e]	0.999	Normal	362 (σ = 8.9)	99 (σ = 8.9)

[a]Kolmogorov-Smirnov.
[b]At 80% confidence, and 90% power, and an MDRD of 20%.
[c]At 80% confidence, and 90% power, and an MDRD OF 40%.
[d]Cheatgrass.
[e]Bulbous bluegrass and muttongrass (species combined by genus when multiple species within a genus occurred).
*σ = Standard deviation.

Table 7-85. Relevance of TEAD Ecological Receptors to Special Status Species

Receptor	Class	Feeding Guild	Receptors Behavior or Food Preferences	Are There Similar Species of Special Status?	Receptor Represents Special Status Species?
Mule deer	Mammalia	Herbivore	Grazing/browsing	No	NA
Kit fox	Mammalia	Omnivore/ Carnivore	Small mammals, invertebrates, vegetation	Yes (spotted bat, Mexican freetail bat, fringed myotis)	Yes ⊗
				(ringtail)	Yes ◆
Jackrabbit	Mammalia	Herbivore	Grazing/browsing	Yes (Wyoming pocket mouse)	Yes O
Deer mouse	Mammalia	Omnivore	Vegetation (~70%) Invertebrates (~30%)	Yes (Wyoming pocket mouse)	Yes ◆
Bald eagle *	Aves	Carnivore	Birds, mammals, fish	Yes (Swainson's hawk, ferruginous hawk, northern goshawk, osprey, burrowing owl, short-eared owl, peregrine falcon)	Yes O
Great horned owl	Aves	Carnivore	Birds, mammals, fish	Yes (Swainson's hawk, ferruginous hawk, northern goshawk, osprey, burrowing owl, short-eared owl, peregrine falcon)	Yes O
Golden eagle *	Aves	Carnivore	Birds, mammals, reptiles	Yes (Swainson's hawk, ferruginous hawk, northern goshawk, osprey, burrowing owl, short-eared owl, peregrine falcon)	Yes O
American kestrel	Aves	Carnivore/ Insectivore	Invertebrates, small mammals	Yes (Swainson's hawk, ferruginous hawk, northern goshawk, osprey, burrowing owl, short-eared owl, peregrine falcon)	Yes ◆
Passerines	Aves	Omnivore	Vegetation (33%) Invertebrates (33%) Vertebrates (33%)	Yes (common yellowthroat, yellow-breasted chat, willow flycatcher)	Yes ◆ ⊗
Soil fauna	Invertebrata	Varies	Varies	No	NA
Plants	Plantae	NA	NA	Yes (Ute ladies' tresses, Clay phacelia)	Yes ◆

* This receptor is a Special Status species.
◆ Adequately represents the listed Special Status species.
O Inadequately represents Special Status species because exposure is lower for the receptor due to a larger home range (affects AUF) and/or behaviors.
⊗ The uncertainty involved varies with the COPC.
NA Not applicable.

Table 7-86. Summary of COPCs with Total Uncertainty Factors (UFs) Greater Than or Equal to 500 (By Receptor)

COPC [a]	Passerines	American Kestrel	Great Horned Owl	Golden Eagle	Bald Eagle	Deer Mouse	Mule Deer	Jackrabbit	Kit Fox
Benzyl alcohol	500	500	500	1000	1000	500	500	200	1000
Cobalt									500
2,4-Dichlorophenoxy-acetic acid (2,4-D)						500	500	500	600
Endosulfan II (beta-Endosulfan)	500	500	500	1000	1000				
Endrin						500	500	500	1000
Endrin aldehyde						500	500	500	1000
Thallium	500	500	500	1000	1000				
1,1,1 trichloro-ethane (111TCE)							500		1000

[a]Chemical of potential concern.

Table 7-87. Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions

Results & Conclusions (See Note 1)

SWMU [a]	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below: Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	SWMU Habitat: Biometric Data	Size, Acres	Condition	Risk Factors: Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Conclusions: Comments
1/1d Open Burn/ Open Detonation (OB/OD)	7.1- H[d] Metals 7% Iron (See Note 6)	AK[e] :4-H Metals 9% Iron	DM[f] : 6.6-H MD[g] : 4.8-H JR[h] : 5.6-H Metals, Explosives 25% Iron + Aluminum	14.8-H Metals Explosives 5% Aluminum	4.4-H Metals 16% Aluminum + Iron	Disturbed and largely devoid of vegetation due to site activities.	350	SWMUs 1 and 1d are currently in use and are regulated by RCRA[i] interim permits.	Health risks for workers trigger clean-up due to explosives and lead.	WOE high and for most receptors, approached that of RSA; WOE≥ RSA WOE for plants and soil fauna. HIs based on soil data only. Moderate to high risk for most receptors. HIs for large raptors < RSA.	Site poses potential for unacceptable ecological risks. Due to active status, cleanup deferred to RCRA closure. Risk Drivers - aluminum, copper, iron, lead, zinc, thallium, TNT in soil.
1b OB/OD - Burn Pads	1.4-C[j] Metals, dioxins 14% Iron	LT[k] -HC	LT-HC	1.2-C Metals	1.2-C Metals 23% Iron	Disturbed and undisturbed sagebrush community. Community moderately similar to RSA. Small mammal density and deer mouse body weight, sex ratio, and age ratio similar to RSA.	1	Generally regraded and revegetated. Not in use.	No risks above guidelines	WOE about average for all receptors but all WOE<RSA; this was primarily a result of fewer samples. HIs based on soil and biota data. Potential low risk to passerines. Low risk to DM, plants and SF[l].	Low ecological risk. Assessment endpoints not measurably affected.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

	Results & Conclusions (See Note 1)										
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
1c OB/OD - Trash Burn Pits	1.3-C Metals, dioxins 17% Iron	LT-HC	LT-HC	1.2-C Metals	1.2-C Metals 26% Iron	Disturbed and undisturbed sagebrush community. Community moderately similar to RSA. Small mammal density and deer mouse body weight, sex ratio, and age ratio similar to RSA.	40	Generally regraded and revegetated. Not in use.	No risks above guidelines	WOE above average for all receptors but all WOE < RSA; this was primarily a result of fewer samples. HIs based on soil and biota data. Potential low risk to passerines. Low risk to DM, MD, JR, plants and SF.	Low ecological risk. Assessment endpoints not measurably affected.
2 Industrial Waste Lagoon (See Note 5 below)										No surface contamination. Ponds and ditches covered. Surface cleanup/closure complete.	Low ecological risk.
3 X-Ray Lagoon	LT-H	LT-H	LT-H	3.5-H Metals	7.7-H Metals	*Lagoon site covered with gravel. Vegetation to north of lagoon may support large and small mammals. Part of a grazing unit.* (See Note 3 below)	0.1	Building active. Remainder of site inactive. Fence in place.	Health risks for possible future residents above guideline levels	WOE below average for all receptors; all WOE < RSA. HIs based on soil data only. Low risk to passerines. Moderate to high risk to plants and soil fauna.	Low ecological risk. High degree of uncertainty exists for plants and soil fauna toxicity data. Small SWMU size precludes significant ecological habitat.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

	Results & Conclusions (See Note 1)										
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[e] Absolute Risk (TEAD HIs > 1)	Comments
4 Sandblast Areas	1.2-H Metals 17% Iron	LT-H	LT-H	1.2-H Metals	13.8-H Metals 5% Iron	*Insufficient area to support significant mammal populations.*	0.2	Majority of area covered with buildings or paving.	Health risks for all future residents (soil ingestion); risks from dermal contact with soil (adult resident)	WOE above average for all receptors but all < RSA; WOE ≥ RSA for plants and soil fauna. HIs based on soil data only. Moderately low risk to passerines. Low risk to DM and plants. High risk to SF.	Low ecological risk. High degree of uncertainty exists for plants and soil fauna toxicity data. Small SWMU size precludes significant ecological habitat. CMS[m] recommends remediation or management for both areas of this SWMU.
5 Pole Transformer PCB Spill								Soil cap in place			Low ecological risk. ROD[n] signed. Remediation complete (soil cover).
6 Old Burn Area	1.0-H Metals 30% Iron	LT-H	DM: 1.1-H Metals 71% Iron	LT-H	1.3-H Metals 26% Iron	*Vegetation provides suitable habitat for small mammals and birds.*	37.2	Inactive area graded and revegetated.	Arsenic, copper and lead above guideline levels in northeast revetment area for future on-site residents & construction worker.	WOE above average for all receptors but all < RSA; WOE = RSA for plants and soil fauna. HIs based on soil data only. Low risk to passerine, DM and SF.	Low ecological risk. Iron contribution to HIs for passerines, DM and SF significantly high.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

Results & Conclusions (See Note 1)

SWMU (a)	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
	Passerine Birds	Raptors and SS (b) Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE(c) Absolute Risk (TEAD HIs > 1)	Comments
7 Chemical Range	LT-H	LT-H	DM: 1.4-H JR: 1.1-H Metals 70% Iron	1.3-H Metals	1.7-H Metals 25% Iron	*Disturbed grassland community. Active population of small mammals may provide prey base for predators.*	81.8	Disturbed areas graded and vegetated. Unused.	Northwest Trench Area risks for particulate inhalation above regulatory criteria.	WOE above average for all receptors but all < RSA; WOE = RSA for plants and soil fauna. HIs based on soil data only. Low risk to DM, JR, plants and SF.	Low ecological risk.
8 Small Arms Firing Range	3.4-H Metals 12% Iron	LT-H	DM: 2.3-H Metals 43% Iron	LT-H	1.8-H Metals 25% Iron	*Extensively disturbed. Small mammals may use the area.*	2.6	Firing range in place, but no longer used.	Lead bullet fragments and leached lead in soil will require remediation.	WOE below average for all receptors; WOE < RSA for plants and soil fauna. HIs based on soil data only. Moderate risk to passerines, DM and SF.	**Site poses potential for unacceptable ecological risk.** Possible remediation to protect human health may mitigate ecological concerns Risk Drivers - lead, chromium, iron, copper, antimony, vanadium, zinc in soil.
9 Drummed Radioactive Waste Storage Area											Low ecological risk. ROD signed.

Table 7-87. Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)

Results & Conclusions (See Note 1)

	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
10 TNT Washout Facility	1.2-C Metals, dioxins 8% Iron	LT-HC	DM: 17.1-C JR: 1.5-C Explosives	3.3-C Metals, TNT	LT-HC	Disturbed grassland/grassland-juniper habitat. Deer mouse age ratio was skewed towards a higher proportion of juveniles; sex ratio was similar to RSA. Small mammal density was not significantly different from the RSA. Age ratio indicates reproduction occurring; density indicates excess mortality not occurring.	4	Some buildings and facilities in place but abandoned. TNT ponds closed and covered. Former ditches abandoned and revegetated. Scheduled for interim action.	Explosives pose unacceptable risk to current workers. Active remediation planned.	WOE high and for most receptors, approach or surpass that of the RSA; WOE = RSA for soil fauna, and greater than RSA for plants. HIs based on soil and biota data. High risk to DM. Moderate risk to plants. Moderate risks to passerines and JR.	**Site poses potential for unacceptable ecological risk.** Include mitigation of ecological risks in Corrective Measures Study. Risk Drivers - dioxins, TNT, RDX, iron, thallium, aluminum, vanadium, and chromium in soil; dioxins, zinc, TNT and RDX in biota.
11 Laundry Effluent Ponds	4.4-H Metals, dioxins 25% Iron	LT-HC	DM: 4.6-H Metals, dioxins, explosives 55% Iron	2.4-H Metals 9% Iron	5.1-H Metals 40% Iron	See discussion of biometric data under SWMU 10.	6	Ponds in place but inactive except for possible septic tank drain field seepage and boiler blowdown collection.	Arsenic and chromium in debris piles exceed regulatory guidelines. Risks to future residents from RDX; active remediation planned.	WOE high, all receptors WOE approached that of RSA; WOE>RSA for plants and soil fauna. HIs based on soil, biota and surface water data. High risk to passerines, DM and SF. Moderately high risk to Plants.	**Site poses potential for unacceptable ecological risks.** Include mitigation of ecological risks in CMS. Risk Drivers - zinc, iron, lead, copper, chromium, cadmium, antimony, TNT, PAHs, dioxins, thallium, aluminum and vanadium in soil and lead, zinc, TNT and RDX in biota.

Table 7-87. Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)

	Results & Conclusions (See Note 1)										
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU (a)	Passerine Birds	Raptors and SS (b) Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE(c) Absolute Risk (TEAD HIs > 1)	Comments
12/15 Pesticide Disposal Area	1.2-C Metals, dioxins 8% Iron	LT-HC	LT-HC	LT-HC	LT-HC	Community not very similar to RSA based on similarity index. Small mammal density, and deer mouse age and sex ratios similar to RSA. Deer mouse body weight heavier than at RSA	30	Inactive.	See below for SWMU 15.	WOE just above average for most receptors; WOE below average for plants and soil fauna. HIs based on soil and biota data. Low risk to passerines, DM, plants, and SF.	**Site poses potential for unacceptable ecological risks.** Consider alternative action as part of SWMU 15. Assessment endpoints not measurably affected. Soil cover planned for SWMU 15 would reduce ecological risks even further. SWMU 12 boundaries are indistinguishable from SWMU 15.
12/15 Sanitary Landfill	2.3-H Metals, dioxins 21% Iron	LT-HC	DM: 1.5-H JR: 1.5-H Metals, dioxins, PAHs, explosives 80% Iron	4.3-C Metals, PAHs	13.8-H Metals, PAHs	Community not very similar to RSA based on similarity index. Small mammal density, and deer mouse age and sex ratios similar to RSA. Deer mouse body weight heavier than at RSA	100	Inactive and graded portion of Sanitary Landfill. Closed to sanitary waste disposal.	Metals & dioxins exceed regulatory guidelines. Soil cover is planned for remedial action.	WOE high & for most receptors, approached that of RSA; WOE>RSA for soil fauna. HIs based on soil & biota data. Moderate to high risk to passerines, DM, JR, SF, and plants.	**Site poses potential for unacceptable ecological risks.** Assessment endpoints not measurably affected. Soil cover would reduce ecological risks. Risk Drivers (SWMUs 12/15): Lead, endrin, arsenic, PAHs, chromium, iron, cadmium, cobalt, antimony, copper, silver, vanadium, zinc, aluminum, thallium (soil); cadmium, copper, dioxins, lead, zinc, TNT, RDX (biota).
13 Tire Disposal Area	LT -H	LT-H	LT-H	LT-H	LT-H	*Extensively disturbed. Area surrounding old gravel pit is a grassland community providing habitat for small mammals and birds.*	30	Tires removed. Floor of gravel pit graded. No activities at the site.	No risks above guidelines.	WOE below average for all receptors; all < RSA;. HIs based on soil data only. Low risk to passerines and SF.	Low ecological risk.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

	Results & Conclusions (See Note 1)										
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
14 Sewage Lagoons (Terrestrial only)	2.5-H Metals	LT-H	LT-H	2.8-H Metals	8.4-H Chromium	*Area surrounding lagoons vegetated with native and non-native species, including cattails; Available to birds.*	5.9	Lagoons continue in operation. Fenced to preclude large animal access.	Management plan developed to preclude contact of personnel with sediments. Any future remediation deferred until facility closure.	WOE just above average for most receptors; approached that of RSA; WOE > RSA for plants and soil fauna. HIs based on soil data only. Low risk to passerines, DM, and plants. High risk to SF.	Low ecological risk. Lagoons may act as a wildlife attractant. Possible future closure by filling with clean soil would mitigate ecological risks but may destroy valuable ecological habitat. High degree of uncertainty exists for Plants and SF toxicity data.
14 Sewage Lagoons (Aquatic only)	20 (Duckling) 63 (Shorebird)	--	--	--	--	Same as above for SWMU 14	5.9	Same as above.	Same as above.	Not evaluated for aquatic ecosystem.	Low ecological risk. Lagoons may act as a wildlife attractant. Same as SWMU 14 above.
17 Former Transformer Storage											Low ecological risk. ROD signed.
18 Radioactive Waste Storage Building (S-659)											Low ecological risk. ROD signed. Closure evaluation underway.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

Results & Conclusions (See Note 1)

	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	**Passerine Birds**	**Raptors and SS** [b] **Species**	**Mammals**	**Plants**	**Soil Fauna**	**Biometric Data**	**Size, Acres**	**Condition**	**Human Health Risk Assessment Results**	**WOE**[e] **Absolute Risk (TEAD HIs > 1)**	**Comments**
19 AED Demilitarization Test Facility	1.9-H Metals 30% Iron	LT-H	DM: 1.6-H Metals 82% Iron	1.9-H Metals	2.0-H Metals 31% Iron	*Vegetation cover is sparse.*	4.2	Facility continues in use in southwest corner of TEAD.	No further action recommended in RFI[c].	WOE below average for all receptors; all < RSA. HIs based on soil data only. Low risk to passerines and DM. Low to moderately low risk to plants and SF.	Moderate ecological risk. High degree of uncertainty exists for Plants and SF toxicity data.
20 AED Deactivation Furnace Site	1.9-H Metals 13% Iron	LT-H	DM: 1.2-H Metals 48% Iron	LT-H	2.2-H Metals 12% Iron	*Introduced woody annuals comprise bulk of sparse vegetation cover.*	8.6	Facility continues in use in southwest corner of TEAD.	Some risks calculated for exposure to metals by possible future residents exceed regulatory guidelines.	WOE above average and for all receptors, WOE = RSA for soil fauna. WOE for plants are < RSA. HIs based on soil data only. Moderate risk to passerines and DM. Low risk to JR and plants. High risk to SF.	Moderate ecological risk. Iron contributes substantially to HIs for passerines and DM and approximately 15% to HIs for SF. High degree of uncertainty exists for Plants and SF toxicity data.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

	Results & Conclusions (See Note 1)										
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
21 AED Deactivation Furnace Building	11.6-H Metals, dioxins 4% Iron	LT-HC	DM: 4.7-H Metals, dioxins, explosives 11% Iron	49.4-H Metals, explosives	76.3-H Metals 15% Iron	Sagebrush/sagebrush juniper habitat. Area most similar to RSA for community structure. Small mammal density and deer mouse sex ratio similar to RSA. Fewer deer mouse juveniles collected.	0.25	Facility continues in use in southwest corner of TEAD.	Risks to construction workers and future residents from exposure to dioxins and explosives exceed regulatory guidelines.	WOE high and for most receptors, approach or surpass that of the RSA; WOE >RSA WOE for soil fauna, and plants. HIs based on soil and biota data. High risk to passerines. Moderately high risk to DM. High risk to plants and SF.	**Site poses potential for unacceptable ecological risks.** Include mitigation of ecological risks in CMS. High degree of uncertainty exists for Plants and SF toxicity data. Iron contributes approximately 10% to DM HI. Risk Drivers : zinc, cadmium, chromium, iron, lead, thallium, TNT, copper, antimony, aluminum, vanadium (soil); dioxins, lead, zinc, RDX, TNT, copper, iron (biota).
22 Building 1303 Washout Pond	LT-H	LT-H	DM: 1.1-H Metals, explosives 7% Iron	37.9-H TNT	1.4-H Metals 26% Iron	*Habitat exists for small mammals and birds.*	0.1	Unused shallow depression in vegetated open area.	Risks from TNT in soil exceeds regulatory guidelines for on-site laborer.	WOE below average for all receptors; WOE < RSA for soil fauna and = to for plants. HIs based on soil data only. Low risk to passerines and DM. High risk to plants; low risk to soil fauna.	Low ecological risk. Although HIs for Plants and SF are relatively high, community level risks are unlikely because the SWMU is small. Small SWMU size precludes significant ecological habitat. High degree of uncertainty exists for Plants and SF toxicity data.

Table 7-87. Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)

	Results & Conclusions (See Note 1)										
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
23 Bomb & Shell Reconditioning Building	1.3-H Metals, PCBs 26% Iron	LT-H	LT-H	LT-H	4.8-H Metals 8% Iron	*Primarily disturbed land which may provide habitat for small animals and birds.*	1.3	Buildings remain in occasional use as a paint shop. Intermittent discharges of wastewater and fire hydrant flushing occur.	Some risk identified for possible future on-site residents.	WOE below average for most receptors; WOE < RSA for soil fauna and plants. HIs based on soil and surface water data. Low risk to passerines, plants & DM. Moderately high risk to SF.	Moderate ecological risk. High degree of uncertainty exists for plants and SF toxicity data.
24 Battery Pit										All subsurface contamination beneath asphalt, i.e., no ecological habitat.	Low ecological risk.
25 Battery Shop	1.7-H Metals 58% Iron	LT-H	DM: 2.6-H Metals 89% Iron	1.0-H Metals	2.8-H Metals 38% Iron	*Primarily disturbed land which may provide habitat for small animals and birds.*	5.2	Building exists but floor drains sealed and no longer in use. Vegetated drainage is fenced.	Some risks calculated for exposure to arsenic, mercury and zinc by possible for future residents and on-site workers exceed regulatory guidelines. Exceedences are for construction workers	WOE below average for all receptors; WOE for plants and soil fauna < RSA. HIs based on soil data only. Moderate risk to passerines, SF, and DM. Low risk to JR and plants.	Low to moderate ecological risk.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

	Results & Conclusions (See Note 1)											
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
26 DRMO Storage Yard	1.2-H Metals	LT-H	LT-H	LT-H	3.6-H Chromium	*Extensively disturbed by human activities. Maybe used by birds and small mammals.*	60	60 acre fenced area in use.	RFI recommends that CMS establish delineation of lead contamination near Building 2003.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Low risk to passerines, JR, and DM. Low to moderate risk to plants and SF.	Low ecological risk.
27 RCRA Container Storage Area	2.5-H Metals	LT-H	LT-H	1.2-H Metals	13.7-H Chromium	*No ecological habitat exists.*	1.3	Fenced, locked building regulated under RCRA.	No further action anticipated until facility closure.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Low risk to passerines, DM, and plants. High risk to SF.	Ecological risks low *except* for soil fauna whose toxicity values reflect high uncertainty.
28 90-Day Drum Storage Area	LT-H	LT-H	LT-H	LT-H	1.3-H Chromium	*Extensively disturbed by human activities. May be used by birds and small mammals.*	3.4	Fenced area in maintenance area currently in use.	No further action recommended in RFI.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Low risk to passerines, DM, plants and SF.	Low ecological risk.

Table 7-87. Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)

Results & Conclusions (See Note 1)

	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
29 Drum Storage Area	LT-H	LT-H	LT-H	LT-H	2.3-H Chromium	*Extensively disturbed by human activities. May be used by birds and small mammals.*	30	Two areas– south area is fenced 25 acre plot of gravel, broken asphalt and a building; north area consists of a 5 acre sparsely vegetated open area.	Risks from soil contact with resident child due to thallium and benzo(a)pyrene.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Low risk to passerines and plants, moderate for SF.	Low ecological risk. CMS to focus on management of contaminants.
30 Old Industrial Wastewater Lagoon	1.3-H Metals 28% Iron	LT-H	DM : 1.2-H Metals 66% Iron	1.1-H Metals	6.3-H Metals 6% Iron	*Disturbed area undergoing re-establishment. May provide habitat for birds and small mammals.*	42	Extensively reworked surface now part of and/or adjacent to the Maintenance Area; BRAC[g] Parcel.	Some risks calculated for exposure to metals by possible future residents exceed regulatory guidelines.	WOE high and for most receptors, approached that of RSA; WOE = RSA for plants and soil fauna. HIs based on soil data only. Low risk to passerines, DM, JR, and plants. High risk to SF.	Moderate ecological risk. High degree of uncertainty exists for Plants and SF toxicity data.
31 Former Transformer Boxing Site	LT-H	LT-H	LT-H	LT-H	LT-H	*Extensively disturbed by human activities. May be used by birds and small mammals.*	4	Graveled storage area within the Maintenance Area. Vehicles are currently parked there	No risks above guidelines.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Very low risk to passerines.	Low ecological risk.

Table 7-87. Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)

Results & Conclusions (See Note 1)

	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	**Passerine Birds**	**Raptors and SS [b] Species**	**Mammals**	**Plants**	**Soil Fauna**	**Biometric Data**	**Size, Acres**	**Condition**	**Human Health Risk Assessment Results**	**WOE[c]** **Absolute Risk (TEAD HIs > 1)**	**Comments**
32 PCB Spill Site	LT-H	LT-H	LT-H	LT-H	LT-H	*Extensively disturbed by human activities. May be used by birds and small mammals.*	0.1	Graveled and non-vegetated equipment storage yard in Maintenance Area	No risks above guidelines.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Very low risk to passerines and plants. Low risk to SF.	Low ecological risk.
33 PCB Storage Building 659									Samples will be taken under BRAC.		Low ecological risk. ROD signed. Closure being planned.
34 Pesticide/ Herbicide Storage Building	LT-H	LT-H	LT-H	LT-H	1.1-H Metals	*Extensively disturbed by human activities. May be used by birds and small mammals.*	0.1	Fenced building in Maintenance Area, still in use.	Some risks calculated for exposure to metals by possible future residents exceed regulatory guidelines.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Low risk to passerines, SF, and plants.	Moderate ecological risk.
35 Wastewater Spreading Area	LT-H	LT-H	LT-H	LT-H	LT-H	*Vegetated area used by birds and small mammals which may provide prey base for predators.*	33	Ditches no longer used. Ditches and spreading area are vegetated. Stable area now in BRAC Parcel.	Some risks calculated for exposure to pesticides by possible future residents exceed regulatory guidelines.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Low risk to DM, passerines, JR, plants, and SF.	Moderate ecological risk.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

	Results & Conclusions (See Note 1)											
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
36 Old Burn Staging Area	LT-H	LT-H	DM: 1.0-H Metals 82% Iron	LT-H	LT-H	*Vegetation around the site might provides suitable habitat for small mammals and birds.*	3	Sparsely vegetated, unused gravel pit.	Some risks calculated for exposure to metals by possible future residents exceed regulatory guidelines.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Low risk to passerines, plants and SF. Moderate risk to DM.	Moderate ecological risk.
37 Contaminated Waste Processor	1.3-C Metals, dioxins 10% Iron	LT-HC	DM: 1.4-C Metals, dioxins, explosives 13% Iron	LT-HC	LT-HC	See SWMU 21 biometric discussion.	1.4	Fenced facility ready for use.	Some risks calculated for exposure to PAHs by possible future residents exceed regulatory guidelines.	WOE high and for most receptors, approach that of the RSA; WOE < RSA for soil fauna, and plants. HIs based on soil and biota data. Low risk to passerines, JR, plants, and SF. Moderate risk to DM.	Moderate ecological risk.
38 Industrial Wastewater Treatment Plant	LT-H	LT-H	LT-H	LT-H	LT-H	*Extensively disturbed by human activities. May be used by birds and small mammals.*	0.3	Active facility in Maintenance Area.	No further action recommended in RFI.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Low risk to passerines, DM and plants.	Low ecological risk.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

	Results & Conclusions (See Note 1)										
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
39 Solvent Recovery Facility									No further action recommended at end of Phase I RFI.	No samples collected at this location.	Low ecological risk.
40 AED Test Range	LT-H	LT-H	DM: 1.4-H Metals, RDX 46% Iron	LT-H	1.1-H Metals 26% Iron	*Extensively disturbed shrub-grassland vegetation providing habitat for small mammals and birds.*	60	Not in use. Partially dismantled facility in open area in the northwest portion of TEAD.	Some risks calculated for exposure to explosives by possible future residents exceed regulatory guidelines.	WOE high and for most receptors, approached that of RSA; WOE = RSA for soil fauna. WOE < RSA for plants. HIs based on soil data only. Low risk to passerines, DM, JR, SF, and plants.	Low ecological risk. A dead lizard was observed on a red stained area according to test pit record (6/23/94)
41 Box Elder Wash Drum Site											Low ecological risk. ROD signed. Remedial action complete.
42 Bomb Washout Facility	9.7-H Metals, dioxins 4% Iron	LT-H	DM: 5.9-H MD: 1.1-H JR: 4.3-H Metals, dioxins, explosives 15% Iron	4.7-H Metals	6.7-H Metals 6% Iron	Community similarity to RSA was less than 50%. Small mammal density, and deer mouse sex ratio, body weight, and age ratios similar to RSA. Small mammal diversity lower than at RSA.	72	Partially fenced, paved area with vehicle wash building presently in use	Risks resulting from exposure to arsenic and antimony by possible future construction workers and residents exceed regulatory guidelines; remediation planned.	WOE exceeds RSA for most receptors; WOE > RSA for plant and soil fauna. HIs based on soil and biota data. Low risk to AK, MD, and KF. High risk to passerines, DM, SF, and plants. Moderate risk to JR.	**Site poses potential for unacceptable ecological risk.** Consider ecological risks as part of CMS. Risk Drivers: barium, cadmium, chromium, iron, lead, thallium, zinc, copper, antimony, aluminum, vanadium in soil; barium, cadmium, dioxins, zinc, lead, TNT, RDX, iron and antimony in biota.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

Results & Conclusions (See Note 1)											
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[e] Absolute Risk (TEAD HIs > 1)	Comments
43 Container Storage Area for P999									No further action recommended at end of Phase 1 RFI.	No samples collected at this location.	Low ecological risk.
44 Tank Storage for TCE									No further action recommended at end of Phase 1 RFI.	No samples collected at this location.	Low ecological risk.
45 Stormwater Discharge Area	1.8-HC Metals, dioxins 15% Iron	LT-HC	DM: 1.0-C Metals, explosives 31% Iron 10% Aluminum	1.8-C Metals, PAHs	2.8-H Metals 9% Iron	Community similarity less than 50% compared to RSA. Small mammal density and deer mouse age and sex ratios similar to RSA. Deer mouse body weight and small mammal diversity slightly lower than at RSA.	10	Intermittently wet area maintains vegetation community.	Some risks calculated for exposure to metals by possible future residents exceed regulatory guidelines.	WOE high and for most receptors, approach or surpass that of the RSA; WOE > RSA for soil fauna, and plants. HIs based on soil, biota and surface water data. Low risk to JR and plants. Moderate risk to SF, DM, and passerines.	Moderate ecological risk. Any remediation would damage valuable wildlife habitat. High degree of uncertainty exists for Plants and SF toxicity data.
46 Used Oil Dumpsters	LT-H	LT-H	LT-H	LT-H	2.4-H Metals 16% Iron	*Extensively disturbed by human activities. May be used by birds and small mammals.*	0.2	17 individual sites in routine use as part of the Maintenance Area.	Exposures result in non-cancer HIs for future resident child at 3 locations (lead), and for future resident adult at 2 locations (lead).	WOE high and for most receptors, approached that of RSA; WOE = RSA for soil fauna, and <RSA for plants. HIs based on soil data only. Low risk to passerines, DM and plants. Moderate risk to SF.	Low ecological risk. Minimal ecological habitat.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

Results & Conclusions (See Note 1)

	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	**Passerine Birds**	**Raptors and SS [b] Species**	**Mammals**	**Plants**	**Soil Fauna**	**Biometric Data**	**Size, Acres**	**Condition**	**Human Health Risk Assessment Results**	**WOE[c] Absolute Risk (TEAD HIs > 1)**	**Comments**
47 Boiler Blowdown Areas	2.2-H TPHC, metals	LT-H	LT-H	LT-H	LT-H	*Extensively disturbed by human activities. May be used by birds and small mammals.*	1.8	Four locations no longer in use in Maintenance Area. Three drained to a contained system; one drained to open ground.	Some risks calculated for exposure to metals by possible future residents exceed regulatory guidelines.	WOE below average for all receptors; WOE < RSA for soil fauna and plants. HIs based on soil data only. Low risk to DM, SF, and plants. Moderate risk to passerines.	Low ecological risk. Very limited ecological habitat.
48 Old Dispensary Discharge						*Extensively disturbed by human activities. May be used by birds and small mammals. Some grazing allowed.*	no data	Site in Administration area; completely graded and planted in grass.	No further action recommended in RFI.	No data available at time of COPC screening.	Low ecological risk. Minimal ecological habitat.
49 Stormwater/ Industrial Wastewater Piping						*No wildlife or plants except for outfall areas.*	200 linear feet of old pipe	Collection of old and new stormwater & wastewater collection systems within the Maintenance area.	Status not known at time of this report.	BRAC parcel SWMU.	Low ecological risk. No ecological habitat.
50 Compressor Condensate Drain - Building 619						*Extensively disturbed by human activities. No ecological habitat.*	15 square feet	A pipe exists the compressor room and enters a perforated stainless steel drum. Allowed to infiltrate into ground below;	No risks above guidelines. No further action recommended in RFI.	BRAC parcel SWMU.	Low ecological risk. No ecological habitat.
51 Chromic Acid/Alodine Drying Beds						*Extensively disturbed by human activities. No ecological habitat.*	30 square feet	Four concrete pads; upper two pads have no berms; lower pads are bermed.	Human health risks for construction and residential use trigger CMS due to metals and SVOCs.	BRAC parcel SWMU. Planned for industrial use.	Low ecological risk which would be mitigated as part of remediation for human health.
52a Possible Drain Field						*Disturbed open field.*	0.9	Vestiges of drainage system remain.	No risks above guidelines.	BRAC parcel SWMU. Future residential use planned.	Low ecological risk.

Table 7-87. *Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)*

	Results & Conclusions (See Note 1)										
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[e] Absolute Risk (TEAD HIs > 1)	Comments
52b Disposal Trenches						*Disturbed open area.*	1	Long mounded trench plus several smaller mounds of earth.	No risks above guidelines.	BRAC parcel SWMU. Future residential use planned.	Low ecological risk.
52c Area Containing Charcoal Material						*Disturbed open field.*	20	Scattered areas of black charcoal material on surface.	Human health risks for residential use trigger CMS due to organics.	BRAC parcel SWMU. Future residential use planned.	Qualitative evaluation concludes that some ecological risk may be present which is expected to be mitigated as part of human health remediation.
52d Horse Stable Area						*Vegetated open field. Horse grazing area.*	33	Open, fenced area with drainage ditch.	Human health risks for residential use trigger CMS due to pesticides.	BRAC parcel SWMU. Future residential use planned.	Qualitative evaluation concludes that some ecological risk may be present which is expected to be mitigated as part of human health remediation.
53 PCB Storage/Spill Sites						*No ecological habitat*	0.25	One entrance building used to store PCB-containing items; spill site was reportedly cleaned up in 1981.	No risks above guidelines. Nor further action recommended in RFI.	BRAC parcel SWMU. No ecological habitat	Low ecological risk.
54 Sandblast Areas						*No ecological habitat*	3.6	Six buildings where sandblasting may have occurred; some buildings show evidence of this activity while others do not.	Human health risks for industrial construction use at 2 buildings trigger CMS due to metals.	BRAC parcel SWMU. No ecological habitat	Low ecological risk.
55 Battery Shop - Building 618						*No ecological habitat*	0.17	Building was converted from a battery maintenance area to a cafeteria.	No further action recommended in RFI.	BRAC parcel SWMU. No ecological habitat	Low ecological risk.

Table 7-87. Summary of TEAD Site-Wide Ecological Risk Assessment (SWERA) Results and Conclusions (continued)

	Results & Conclusions (See Note 1)											
	Relative Risk - Hazard Index (HI) Relative to the Reference Study Area (RSA) - See Notes-2 and 4 Below					SWMU Habitat			Risk Factors		Conclusions
SWMU [a]	Passerine Birds	Raptors and SS [b] Species	Mammals	Plants	Soil Fauna	Biometric Data	Size, Acres	Condition	Human Health Risk Assessment Results	WOE[c] Absolute Risk (TEAD HIs > 1)	Comments
56 Gravel Pit						*Very limited ecological habitat.*	< 0.5	Bermed area adjacent to Building 699	Risks to industrial and construction worker & future resident from thallium, benzo(a)anthracene, antimony, cadmium and lead trigger CMS due to metals and organics.	Not evaluated in SWERA due to limited habitat.	Qualitative evaluation concludes that some ecological risk may be present which is expected to be mitigated as part of human health remediation.
57 Skeet Range						*Open grassy area.*	10	Skeet range next to SWMU 52 drain field	Risks to resident trigger CMS due to benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and lead.	BRAC parcel SWMU.	Qualitative evaluation concludes that some ecological risk may be present which is expected to be mitigated as part of human health remediation.
Area of Concern-3 Extraction Well 15						*Cattle grazing in surrounding area; grassland community provides habitat for small mammals, birds.*	–	Possible water disposal area in open revetment area.	No risk above guidelines; no further action recommended in RFI.	Not evaluated in SWERA due to limited habitat.	Low ecological risk.
Area of Concern-4 National Guard Training Site.						*Grassy area.*	15-20 square feet	Small fenced area.	No risk above guidelines; no further action recommended in RFI.	Not evaluated in SWERA due to limited habitat.	Low ecological risk.

Note 1.—Refer as necessary to the following tables 7-88 Through 7-130.
Note 2.—Values represent the multiplier by which TEAD SWMU hazard indices (HIs) exceed the RSA HIs (i.e., TEAD HI + RSA HI).
Note 3.—Italics represent qualitative "walk-through" survey observations or information obtained from RI or RFI documents.
Note 4.—Highest HI value (i.e., "worst case") for either TEAD historic data or TEAD current data used for comparison to the RSA.
Note 5.—Shaded rows represent SWMUs not included in quantitative risk assessment.
Note 6.—Iron and/or aluminum percentage contribution to the HI applies to all listed receptors unless otherwise specified.

[a]Solid waste management unit.
[b]Special Status.
[c]Weight of evidence.
[d]Historical data.
[e]American kestrel.
[f]Deer mouse.
[g]Mule deer.
[h]Jackrabbit.
[i]Resource Conversation and Recovery Act.
[j]Current data - ESA SWMUs.
[k]Less than RSA.
[l]Soil fauna.
[m]Corrective Measures Study.
[n]Record of Decision.
[o]RCRA Facility Investigation.
[p]Base Realignment and Closure.

Table 7-88. Risk Description and Interpretation: SWMUs 1/1d-Open Burn/Open Detonation (OB/OD)

SWMUs 1/1d	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=643.2H[b]	Not sampled	Cu (11) Fe (7) Pb (32) Tl (18) Zn (42)	NA[c]	Soil (100%)	Potential high risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 350 acres, area large enough to support populations	•Thallium risks highly uncertain • About half the risk due to nutrients
Am. Kestrel HI=19.9H	Not sampled	Cu (14) Fe (9) Pb (9) Tl (5) Zn (56)	NA	Soil (100%)	Potential moderate risk	•Represents Special Status species	•Area large enough to support small populations	•Thallium risks highly uncertain • Over half the risk due to nutrients
Great Horned Owl HI=0.7H	Not sampled	Cu (11) Fe (7) Pb (33) Zn (42)	NA	Soil (100%)	Potential low risk	•Represents Special Status species	•Area large enough to provide significant exposure	•About half the risk due to nutrients
Golden Eagle HI=1.3H	Not sampled	Cu (12) Fe (7) Pb (28) Tl (5) Zn (46)	NA	Soil (100%)	Potential low risk	•Special Status Species	•Area large enough to provide significant exposure	•Over half the risk due to nutrients
Bald Eagle HI=1.3H	Not sampled	Cu (12) Fe (7) Pb (28) Tl (5) Zn (46)	NA	Soil (100%)	Potential low risk	•Special Status Species	•Area large enough to provide significant exposure	•Over half the risk due to nutrients
Deer Mouse HI=186.8H	Not sampled	Al (6) Cu (16) Fe (17) Pb (15) RDX (7) TNT (29) Zn (7)	NA	Soil (100%)	Potential high risk	•Represents Special Status species •Important prey item	•Area large enough to support populations	•About 25% of the risk due to nutrients
Mule Deer HI=16.7H	Not sampled	Al (6) Cu (12) Fe (22) Pb (19) RDX (9) TNT (23)	NA	Soil (100%)	Potential moderate risk	•No similar Special Status species	•Area large enough to support populations	•About 1/4 of the risk due to nutrients

Table 7-88. Risk Description and Interpretation: SWMUs 1/1d-Open Burn/Open Detonation (OB/OD) (continued)

SWMUs 1/1d	**Risk Drivers** (% COPC contribution)		**Driving Pathway**		**Risk Interpretation**	**Relevance**		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Jackrabbit HI=53H	Not sampled	Al (5) Cu (12) Fe (22) Pb (19) RDX (9) TNT (23) Zn (6)	NA	Soil (100%)	Potential moderate risk	•Common prey item	•Area large enough to support populations	•About 30% of the risk due to nutrients
Kit Fox HI=15.4H	Not sampled	Al (6) Cu (11) Fe (24) Pb (22) RDX (10) TNT (16) Zn (6)	NA	Soil (100%)	Potential low risk	•Represents Special Status species	•Area large enough to support populations	•About 40% of the risk due to nutrients
Soil Fauna HI=200H	Not sampled	Cr (24) Cu (32) Fe (12) Zn (25)	NA	Direct contact (100%)	Potential moderate risk	•Important prey base	•Site large enough to support populations	•More than half the risk due to nutrients
Plants HI=605.6H	Not sampled	Al (5) Cu (9) TNT (48) Zn (33)	NA	Direct contact (100%)	Potential high risk	•Plants provide community structure/ habitat • Plants largely absent	•Site large enough to support populations	•About 40% of the risk due to nutrients

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) high and for most receptors, approached that of reference study area (RSA); WOE ≥ RSA WOE for plants and soil fauna.

Absence of dietary intakes may underestimate risk. HIs calculated for this SWMU 1/1d based solely on soil ingestion are elevated sufficiently to cause the overall SWMU risk to be unacceptable.

Conclusions: This area presents probable excessive or unacceptable ecological risks to mammals, birds, soil fauna and plants.

Table 7-89. Risk Description and Interpretation: SWMU 1b - OB/OD Burn Pads

SWMU 1b	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=182C[b] HI=7H[c]	Cd (10) Cr (5) Diox (30) Fe (14) Tl (27) Zn (6)	Cd (80) Pb (20)	Soil (53%) Diet (47%)	Soil (100%)	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 1 acre, site too small to support populations, only individuals or breeding pairs	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •20% of risk due to nutrients •Thallium HQs based on nondetects •Some Cd, Zn, and dioxin risks based on nondetects
Am. Kestrel HI=0.3C HI=0H	None	None	NA[d]	NA	NA	NA	NA	NA
Great Horned Owl HI=0C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0C HI=0H	None	None	NA	NA	NA	NA	NA	NA

Table 7-89. Risk Description and Interpretation: SWMU 1b - OB/OD Burn Pads (continued)

SWMU 1b	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Deer Mouse HI=82.1C HI=0.2H	Al (10) Diox (11) Fe (28) RDX (17) Tl (6) TNT (11)	None	Soil (36%) Diet (64%)	NA	Potential moderate risk	•Important prey item •Represents Special Status species	•Site too small to support populations	•Munitions data based on sublethal or NOAEL endpoints •Risk due to RDX based on 30 day oral exposure by rats. TNT based on lifetime •Dioxin risks uncertain (based on 1 study) •Almost 1/3 risk due to nutrients •Thallium HQs based on nondetects •Some RDX and TNT dietary risks due to nondetects
Mule Deer HI=0C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.4H HI=0H	None	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0.2C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=54.2C HI=0.3H	Al (7) Cr (67) Fe (23)	None	NA	NA	Potential moderate risk	•Provide important prey base	•Site too small to support population	•Chromium risks based on only one study •Almost 1/4 risk due to nutrients

Table 7-89. Risk Description and Interpretation: SWMU 1b - OB/OD Burn Pads (continued)

SWMU 1b	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=48.8C HI=1.7H	Al (31) Tl (35) V (20)	Cd (99)	Direct contact (100%)	Direct contact (100%)	Potential moderate risk	•Plants provide community structure/ habitat	•Site too small to support populations	•Thallium, vanadium toxicity based on one study (weak) •Thallium HQs based on nondetects

[a]HI=Total absolute hazard index. [b]C=Current data. [c]H=Historic data. [d]NA=Not applicable.

Weight-of-evidence (WOE) about average for all receptors but all WOE<reference study area (RSA); this was primarily a result of fewer samples. Absence of dietary information for historic data may underestimate risk.

The only biological effect noted was a slight difference in community similarity with the RSA. As the site is only 1 acre in size, any potential effects are likely to be at the individual, and not population, level.

Conclusions: This area is not likely to pose unacceptable or excessive ecological risks due to its small size and site-related risks relative to the RSA.

Table 7-90. Risk Description and Interpretation: SWMU 1c - OB/OD Trash Burn Pits

SWMU 1c	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=169C[b] HI=0.01H[c]	Cr (6) Diox (32) Fe (17) Tl (29) Zn (5)	None	Soil (55%) Diet (45%)	NA[d]	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 40 acres, site large enough to support small populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Almost 1/4 of risk due to nutrients •Thallium HQs based on nondetects •Some dietary dioxin risk due to nondetects
Am. Kestrel HI=2.2C HI=0H	Diox (63) Fe (7) Tl (11) Zn (6)	None	Soil (21%) Diet (79%)	NA	Potential low risk	•Represents Special Status species	•Site forms a significant area of home range for a breeding pair	•Thallium HQs based on nondetects •Dioxin risks uncertain (based on 1 study)
Great Horned Owl HI=0.1C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.2C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.2C HI=0H	None	None	NA.	NA	NA	NA	NA	NA
Deer Mouse HI=85.9C HI=0H	Al (10) Diox (10) Fe (32) RDX (17) Tl (6) TNT (11)	None	Soil (40%) Diet (60%)	NA	Potential moderate risk	•Represents Special Status species •Important prey item	•Site large enough to support populations	•Dioxin risks uncertain (based on 1 study) •One third of the risk due to nutrients •Munitions risk based on sublethal or NOAEL endpoint •Thallium HQs based on nondetects •Some RDX and TNT dietary risks due to nondetects

Table 7-90. Risk Description and Interpretation: SWMU 1c - OB/OD Trash Burn Pits (continued)

SWMU 1c	**Risk Drivers** (% COPC contribution)		**Driving Pathway**		**Risk Interpretation**	**Relevance**		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Mule Deer HI=1.5C HI=0H	Al (6) Diox (12) Fe (26) RDX (32) TNT (11)	None	Soil (27%) Diet (73%)	NA	Potential low risk	•No similar Special Status species	•Site large enough to support small populations intermittently	•Dioxin risks uncertain (based on 1 study) •Over 1/4 of the risk due to nutrients •Munitions risk based on sublethal or NOAEL endpoint
Jackrabbit HI=16.2C HI=0H	Al (5) Diox (12) Fe (26) RDX (32) TNT (12)	None	Soil (27%) Diet (73%)	NA	Potential low risk	•Common prey item	•Site large enough to support small populations intermittently	•Dioxin risks uncertain (based on 1 study) • Over 1/4 of the risk due to nutrients •Munitions risk based on sublethal or NOAEL endpoint •Some RDX and TNT dietary risks due to nondetects
Kit Fox HI=3C HI=0H	Diox (81) Fe (11)	None	Soil (14%) Diet (86%)	NA	Potential low risk	•Represents Special Status species	•Site size a significant component of home range	•Dioxin risks highly uncertain, as evidence suggests species differences in response to these compounds
Soil Fauna HI=57C HI=0H	Al (7) Cr (66) Fe (26)	None	Direct contact (100%)	NA	Potential low risk	•Provide important prey base	•Site large enough to support populations	•Chromium risks based on one study (weak) •Over 1/4 of risk due to nutrients

Table 7-90. Risk Description and Interpretation: SWMU 1c - OB/OD Trash Burn Pits (continued)

SWMU 1c	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=48.9C HI=0H	Al (33) Tl (35) V (23)	None	Direct contact (100%)	NA	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support populations	•Area revegetated, which indicates predicted may overestimate actual risks •Thallium HQs based on nondetects

[a]HI=Total absolute hazard index. [b]C=Current data. [c]H=Historic data. [d]NA=Not applicable.

Weight-of-evidence (WOE) above average for all receptors but all WOE < reference study area (RSA); this was primarily a result of fewer samples. Absence of dietary information for historic data may underestimate risks.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors.

Table 7-91. Risk Description and Interpretation: SWMU 3 - X-Ray Lagoon

SWMU 3	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=16.9H[b]	Not sampled	Ag (15) Cr (75)	NA[c]	Soil (100%)	Potential low to risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 0.1 acre, site not large enough to support populations	•Chromium not as toxic under field conditions as laboratory studies would indicate based on TBVs
Am. Kestrel HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=0.3H	Not sampled	None	NA	NA	NA	NA	NA	NA
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=349.2H	Not sampled	Cr (99)	NA	Direct contact (100%)	Potential high risk	•Important prey items	•Site not large enough to support small populations	•Chromium TBV based on one study (weak)

Table 7-91. Risk Description and Interpretation: SWMU 3 - X-Ray Lagoon (continued)

SWMU 3	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=142H	Not sampled	Ag (93)	NA	Direct contact (100%)	Potential moderate risk	•Plants provide community structure/ habitat	•Site not large enough to support small populations	•Silver TBV based on one study (weak)

[a]HI=Total absolute hazard index. [b]H=Historic. [c]NA=Not applicable.

WOE below average for all receptors; all WOE < reference study area (RSA). Absence of dietary intakes may underestimate risk.

At 0.1 acres, there is insufficient space to support wildlife and plant communities. However, this is part of a grazing unit, and large wildlife and domestic mammals may graze north of lagoon. As no risks are predicted to mule deer or jackrabbits, risks to other grazing mammals are also minimal.

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks due to small size and uncertain toxicity information.

Table 7-92. Risk Description and Interpretation: SWMU 4 - Sand Blast Areas

SWMU 4	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=104.4H[b]	Not sampled	Cd (7) Cr (42) Fe (17) Pb (7) Tl (20) Zn (5)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 0.2 acre, site not large enough to support populations	•Cr less toxic in avian field studies than in laboratory tests •Over 20% of risk due to nutrients
Am. Kestrel HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=10.2H	Not sampled	Fe (75) Pb (5) Tl (12)	NA	Soil (100%)	Potential low risk	•Important prey item • Represents Special Status species	•Site not large enough to support populations	•Majority of risk is due to a nutrient
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.04H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=629.5H	Not sampled	Cr (94) Fe (5)	NA	Direct contact (100%)	Potential high risk	•Important prey bases	•Site not large enough to support populations	•Chromium benchmark based on one study (weak)

Table 7-92. Risk Description and Interpretation: SWMU 4 - Sand Blast Areas (continued)

SWMU 4	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=49.6H	Not sampled	Cd (14) Cr (6) Tl (45) Zn (24)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site not large enough to support populations	•Several metals present risks •Almost 1/4 of risk due to a nutrient

[a]HI=Total absolute hazard index. [b]H=Historic. [c]NA=Not applicable.

Weight-of-evidence (WOE) above average for all receptors; all < reference study area (RSA), except WOE ≥ RSA for plants and soil fauna.

At 0.2 acres, there is insufficient space to support wildlife and plant communities. Absence of dietary intakes may underestimate risk.

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks because small spatial scale precludes site-related population effects.

Table 7-93. Risk Description and Interpretation: SWMU 6 - Old Burn Area

SWMU 6	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=95.6H[b]	Not sampled	Cr (10) Fe (30) Pb (49) Zn (5)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 37 acres, site large enough to support small populations	•About 35% of the risk due to nutrients • Lead a known avian toxicant
Am. Kestrel HI=0.3H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=30.3H	Not sampled	Fe (71) Pb (21)	NA	Soil (100%)	Potential low risk	•Important prey item • Represents Special Status species	•Site large enough to support populations	•Almost 3/4 of the risk due to a nutrient
Mule Deer HI=0.4H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=4.0H	Not sampled	Fe (72) Pb (21)	NA	Soil (100%)	Potential low risk	•Common prey item	•Site large enough to support populations	•Almost 3/4 of the risk due to a nutrient
Kit Fox HI=0.4H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=60.7H	Not sampled	Cr (68) Fe (26)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Site large enough to support populations	•Chromium risks based on one study (weak) •Over 1/4 of risk due to a nutrient

Table 7-93. Risk Description and Interpretation: SWMU 6 - Old Burn Area (continued)

SWMU 6	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=21.1H	Not sampled	As (13) Pb (9) V (50) Zn (17)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•As is phytotoxic

[a]HI=Total absolute hazard index. [b]H=Historic. [c]NA=Not applicable

Weight-of-evidence (WOE) above average for all receptors; all WOE <reference study area (RSA) except WOE = RSA for soil fauna.

Absence of dietary intakes may underestimate risk. Relative risk remains low, which is more indicative of site-related risks than the absolute risk.

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks to TEAD receptors, based on risk relative to RSA.

Table 7-94. Risk Description and Interpretation: SWMU 7 - Chemical Range

SWMU 7	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=61.2H[b]	Not sampled	Cr (18) Fe (59) Zn (11)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 82 acres, site large enough to support small populations	•Over half of the risk are due to nutrients
Am. Kestrel HI=0.6H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.03H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.03H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=41.2H	Not sampled	Al (28) Fe (65)	NA	Soil (100%)	Potential low risk	•Important prey item • Represents Special Status species	•Site large enough to support populations	•Over half of the risk due to a nutrient
Mule Deer HI=1.0H	Not sampled	Al (24) Fe (73)	NA	Soil (100%)	Potential low risk	•No similar Special Status species	•Site large enough to support populations	•Almost 3/4 of the risk due to a nutrient
Jackrabbit HI=10.6H	Not sampled	Al (20) Fe (74)	NA	Soil (100%)	Potential low risk	•Common prey item	•Site large enough to support populations	•Almost 3/4 of the risk due to a nutrient
Kit Fox HI=1.1H	Not sampled	Al (22) Fe (67)	NA	Soil (100%)	Potential low risk	•Represents Special Status species	•Site large enough to support populations	•Well over half of the risk due to a nutrient
Soil Fauna HI=79.1H	Not sampled	Al (10) Cr (62) Fe (25)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Site large enough to support populations	•Chromium risks based on one study (weak)

Table 7-94. Risk Description and Interpretation: SWMU 7 - Chemical Range (continued)

SWMU 7	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=54.9H	Not sampled	Al (55) As (5) V (26) Zn (10)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Aluminum not as toxic in alkaline soils. Rely on relative risk

[a]HI=Total absolute hazard index. [b]H=Historic. [c]NA=Not applicable

Weight-of-evidence (WOE) near or above average for all receptors; all WOE <reference study area (RSA) except WOE = RSA for plants and soil fauna.

Absence of dietary intakes may underestimate risk. Relative risk is low, which is more indicative of site-related risks than the absolute risk.

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks to TEAD receptors, based on risk relative to RSA.

Table 7-95. Risk Description and Interpretation: SWMU 8 - Small Arms Firing Range

SWMU 8	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=304.8H[b]	Not sampled	Fe (12) Pb (81)	NA[c]	Soil (100%)	Potential high risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 2.6 acres, site large enough to support several breeding pairs	•Lead a known avian toxicant
Am. Kestrel HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=65.8H	Not sampled	Fe (43) Pb (51)	NA	Soil (100%)	Potential moderate risk	•Important prey item •Represents risks to Special Status species	•Site may support small populations	•Lead a known toxicant •Over 40% of risk due to a nutrient
Mule Deer HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.6H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=83.8H	Not sampled	Cr (62) Fe (25) Pb (10)	NA	Direct contact (100%)	Potential moderate risk	•Important prey base	•Site may support small populations	•Chromium risks are uncertain •About 25% of risk due to nutrient

Table 7-95. Risk Description and Interpretation: SWMU 8 - Small Arms Firing Range (continued)

SWMU 8	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=35.3H	Not sampled	Cu (6) Pb (29) Sb (15) V (38) Zn (5)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Numerous metals present potential risks although low relative risks

[a]HI=Total absolute hazard index. [b]H=Historic. [c]NA=Not applicable.

Weight-of-evidence (WOE) below average, and for all receptors < reference study area (RSA).

Absence of dietary intakes may underestimate risk.

Conclusions: This area is likely to pose excessive or unacceptable ecological risks to birds, small mammals, and soil fauna based on risks relative to RSA, magnitude of HIs, and number of COPCs.

Table 7-96. Risk Description and Interpretation: SWMU 10 - TNT Washout Facility

SWMU 10	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=151.6C[b] HI=1.7H[c]	Diox (42) Fe (9) Tl (32) Zn (5)	Diox (100)	Soil (47%) Diet (53%)	Soil (100%)	Potential moderate-risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site could support small populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Thallium HQs based on nondetects •Some dioxin and Zn dietary risks due to nondetects
Am. Kestrel HI=0.3C HI=0H	None	None	NA[d]	NA	NA	NA	NA	NA
Great Horned Owl HI=0.01C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.02C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.02C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=1543.2C HI=35.8H	RDX (93)	RDX (27) TNT (71)	Soil (1%) Diet (99%)	Soil (100%)	Potential high risk	•Important prey item •Represents a Special Status species	•Could support small populations	•Munitions data based on sublethal or NOAEL endpoints
Mule Deer HI=4.8C HI=0.03H	RDX (98)	None	Diet (100%)	NA	Potential low risk	•Herbivore-plants accumulate RDX •No similar Special Status species	•Exposure not likely to be chronic due to relatively small SWMU size (4 ac.)	•Munitions data based on sublethal or NOAEL endpoints
Jackrabbit HI=52.4C HI=0.4H	RDX (98)	None	Diet (100%)	NA	Potential moderate risk	•Herbivore-plants accumulate RDX •Common prey item	•Exposure not likely to be chronic due to relatively small SWMU size (4 ac.)	•Munitions data based on sublethal or NOAEL endpoints

Table 7-96. Risk Description and Interpretation: SWMU 10 - TNT Washout Facility (continued)

SWMU 10	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Kit Fox HI=0.4C HI=0.03H	None	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=24.9C HI=0H	Al (6) Cr (66) Fe (26)	None	Direct contact (100%)	NA	Potential low risk	•Important prey base	•Could support small populations	•Chromium risks uncertain since based on 1 study (weak) •Over 1/4 of risk due to nutrients
Plants HI=30.2C HI=137.2H	Al (18) Tl (57) V (15)	TNT (100)	Direct contact (100%)	Direct contact (100%)	Potential moderate risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Revegetation indicates risks may be overestimated •Thallium HQs based on nondetects

[a]HI=Total absolute hazard index. [b]C=Based on current data set. [c]H=Based on historic data set. [d]NA=Not applicable.

Weight-of-evidence (WOE) high and for most receptors, approached that of reference study area (RSA); WOE ≥ RSA WOE for deer mice, plants and soil fauna.

Conclusions: This area is likely to pose excessive or unacceptable ecological risks to mammals, birds, soil, fauna and plants.

Table 7-97. Risk Description and Interpretation: SWMU 11 - Laundry Effluent Ponds

SWMU 11	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=505.6C[b] HI=397.6H[c]	Diox (12) Fe (18) Pb (38) Tl (10) Zn (15)	Cr (6) Cu (17) Fe (25) Pb (42) Zn (5)	Soil (51%) Diet (49%)	Soil (100%)	Potential high risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site could support small populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) • Lead a known avian toxicant. •Substantial amount of risk due to nutrients •Thallium HQs based on nondetects •Some Pb, Zn, and dioxin dietary risks due to nondetects
Am. Kestrel HI=0.8C HI=0.3H	None	None	NA[d]	NA	NA	NA	NA	NA
Great Horned Owl HI=0.1C HI=0.01H	None	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.1C HI=0.03H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.1C HI=0.03H	None	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=175.2C HI=130.1H	Diox (29) Fe (40) Pb (6) RDX (8) TNT (5)	Cu (23) Fe (55) Pb (17)	Soil (49%) Diet (51%)	Soil (100%)	Potential high risk	•Represents Special Status species •Important prey item	•Could support small populations	•Dioxin risks uncertain (based on 1 study) •About half of the risk due to nutrients •Some RDX and TNT dietary risks due to nondetects

Table 7-97. Risk Description and Interpretation: SWMU 11 - Laundry Effluent Ponds (continued)

SWMU 11	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Mule Deer HI=0.5C HI=0.5H	None	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=4.49C HI=3.6H	Diox (5) Fe (39) PAH (5) Pb (5) RDX (18) TNT (18)	Cu (11) Fe (50) PAH (6) Pb (14) TNT (15)	Soil (41%) Diet (34%) Surface Water (25%)	Soil (85%) Surface Water (15%)	Potential low risk	•This species probably will not ingest surface water •Common prey item	•Site too small for populations; i.e., no chronic exposure	•Dioxin risks uncertain (based on 1 study) •Munitions produce the highest risk except for nutrients
Kit Fox HI=1.4C HI=0.8H	Diox (35) Fe (19) PAH (10) Pb (14) TNT (14)	None	Soil (10%) Diet (52%) Surface Water (38%)	NA	Potential low risk	•Represents Special Status species	•Site too small for populations, i.e., no chronic exposure	•Dioxin risks uncertain (based on 1 study) •Munitions produce the highest risk except for nutrients
Soil Fauna HI=120.3C HI=233.1H	Cr (52) Fe (40)	Cr (46) Cu (27) Fe (23)	Direct contact (100%	Direct contact (100%	Potential high risk	•Important prey base	•Site could support populations	•Almost ½ of risk due to nutrients, although high relative risk indicates problem
Plants HI=55.2C HI=100H	Al (9) Pb (6) Sb (6) Tl (31) V (7) Zn (30)	Cu (52) Pb (7) Sb (15) Zn (15)	Direct contact (100%)	Direct contact (100%)	Potential moderate risk	•Plants provide community structure/ habitat	•Site could support populations	•About ½ of risk due to nutrients, although high relative risk indicate problem •Thallium HQs based on nondetects

[a]HI=Total absolute hazard index. [b]C=Based on current data set. [c]H=Based on historic data set. [d]NA=Not applicable.

Weight-of-evidence (WOE) high and for most receptors, approached that of reference study area (RSA); WOE > RSA WOE for passerine birds, deer mice, plants and soil fauna.

Conclusions: This area is likely to pose excessive or unacceptable ecological risks to mammals, birds, soil fauna and plants.

Table 7-98. Risk Description and Interpretation: SWMU 12 - Pesticide Disposal Area

SWMU 12	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=156.4C[b] HI=5H[c]	Cr (5) Diox (35) Fe (8) Pb (6) Tl (31) Zn (7)	As (12) E_I (17) Pb (70)	Soil (50%) Diet (50%)	Soil (100%)	Potential high risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Exposure could be chronic	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Thallium HQs based on nondetects •Some Pb, Zn and dioxin dietary risks due to nondetects
Am. Kestrel HI=2.3C HI=0.01H	Diox (50) Tl (8) Zn (21)	None	Soil (14%) Diet (86%)	NA[d]	Potential low risk	•Represents Special Status species	•Exposure could be chronic	•Thallium risks based on nondetects •Dioxin risks uncertain (based on 1 study)
Great Horned Owl HI=0.1C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.1C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.1C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=50.4C HI=0.7H	Al (7) Cu (5) Diox (16) Fe (22) RDX (18) Tl (10) TNT (5)	None	Soil (36%) Diet (64%)	NA	Potential low risk	•Represents Special Status species •Important prey item	•Exposure could be chronic; site could support populations	•Thallium HQs based on nondetects •Dioxin risks uncertain (based on 1 study) •Over 1/4 of risk due to nutrients •Some dioxin, RDX, and TNT dietary risks due to nondetects

Table 7-98. Risk Description and Interpretation: SWMU 12 - Pesticide Disposal Area (continued)

SWMU 12	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Mule Deer HI=0.6C HI=0.01H	None	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=5.9C HI=0.1H	Fe (20) RDX (41) Tl (8) TNT (7)	None	Soil (29%) Diet (71%)	NA	Potential low risk	•Herbivore mainly exposed to RDX in diet •Common prey item	•Exposure unlikely to be chronic	•Munitions TBVs are adequate since based on sublethal endpoints •Thallium HQs based on nondetects •Some RDX dietary risks due to nondetects
Kit Fox HI=2.5C HI=0.01H	Diox (82) Fe (6)	None	Soil (7%) Diet (93%)	NA	Potential low risk	•Represents Special Status species	•Could support a breeding pair, so exposure chronic	•Dioxin risks species-dependent, uncertain
Soil Fauna HI=38C HI=0.4H	Al (5) Cr (77) Fe (16)	None	Direct contact (100%)	NA	Potential low risk	•Important prey base	•Site could support populations	•Cr risk based on 1 study so are uncertain
Plants HI=33.9C HI=1.8H	Al (20) Tl (51) V (14)	As (67) PAH (26) Pb (8)	Direct contact (100%)	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Could support populations	•Arsenic is phytotoxic •Thallium HQs based on nondetects

[a]HI=Total absolute hazard index. [b]C=Based on current data set. [c]H=Based on historic data set. [d]NA=Not applicable.

Weight-of-evidence (WOE) just above average for most receptors; WOE below average for plants and soil fauna.

At 30 acres, there is sufficient space to support wildlife and plant communities. The only biological effect noted was a difference in community similarity with the RSA. While this may relate to contamination, it is known that excessive grazing reduces forbs and grasses, thereby altering community structure (Cooperider et al., 1986). The boundaries of this SWMU are not distinct from SWMU 15, where the bulk of contamination occurs.

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks to birds, mammals, soil fauna and plants since risks relative to RSA are low. Remediation planned for SWMU 15 would reduce ecological risks even further.

Table 7-99. Risk Description and Interpretation: SWMU 15 - Sanitary Landfill

SWMU 15	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=366.7C[b] HI=211.7H[c]	Cd (5) Cr (8) Cu (16) Diox (16) Fe (19) Pb (6) Tl (13) Zn (12)	Cr (62) Fe (21)	Soil (65%) Diet (35%)	Soil (100%)	Potential high risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site is large and could support populations; exposure could be chronic	•Cr less toxic in avian field studies than in laboratory tests •Dioxin risks uncertain (based on 1 study) •Iron, copper, zinc are nutrients •Thallium HQs based on nondetects •Some Cd, Cu, Pb, Zn, and dioxin dietary risks due to nondetects
Am. Kestrel HI=9.4C HI=2.4H	Cu (14) Diox (38) Fe (9) Tl (6) Zn (18)	Cr (65) Fe (22)	Soil (29%) Diet (71%)	Soil (100%)	Potential low risk	•Represents Special Status species	•Site is large enough to support small populations; exposure could be chronic	•Cr less toxic in avian field studies than in laboratory tests •Dioxin risks uncertain (based on 1 study) •Iron, copper, zinc are nutrients •Thallium HQs based on nondetects •Some Cu, Zn, and dioxin dietary risks due to nondetects
Great Horned Owl HI=0.8C HI=0.1H	None	None	NA[d]	NA	NA	NA	NA	NA
Golden Eagle HI=0.8C HI=0.1H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.8C HI=0.1H	None	None	NA	NA	NA	NA	NA	NA

Table 7-99. *Risk Description and Interpretation: SWMU 15 - Sanitary Landfill (continued)*

SWMU 15	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Deer Mouse HI=152.9C HI=41.7H	Cu (16) Diox (9) Fe (35) PAH (10) RDX (6) TNT (6)	Cu (5) Fe (78)	Soil (68%) Diet (32%)	Soil (100%)	Potential moderate risk	•Represents Special Status species •Important prey item	•Site may support populations	•Dioxin risks uncertain (based on 1 study) •Over 50% of the risk is due to nutrients • Munitions TBVs based on sublethal endpoints •Some Fe, RDX, TNT, and dioxin dietary risks due to nondetects
Mule Deer HI=5.4C HI=1.3H	Cu (9) Diox (10) Fe (34) PAH (9) RDX (14) TNT (8)	Fe (84)	Soil (57%) Diet (43%)	Soil (100%)	Potential low risk	•No similar Special Status species	•Site may temporally support populations; exposure probably intermittent	•Dioxin risks uncertain (based on 1 study) •Over 50% of the risk is due to nutrients • Munitions TBVs based on sublethal endpoints •Some RDX dietary risks due to nondetects
Jackrabbit HI=58.6C HI=14.4H	Cu (9) Diox (10) Fe (34) PAH (9) RDX (14) TNT (8)	Fe (82)	Soil (56%) Diet (44%)	Soil (100%)	Potential moderate risk	•Common prey item	•Site may temporally support populations; exposure probably intermittent	•Dioxin risks uncertain (based on 1 study) •Almost 50% of the risk is due to nutrients • Munitions TBVs based on sublethal endpoints •Some RDX and TNT dietary risks due to nondetects

Table 7-99. Risk Description and Interpretation: SWMU 15 - Sanitary Landfill (continued)

SWMU 15	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Kit Fox HI=10.7C HI=1.4H	Cu (7) Diox (60) Fe (17) PAH (5)	Fe (79)	Soil (29%) Diet (71%)	Soil (100%)	Potential low risk	•Represents Special Status species	•Site could support several breeding pairs	•Dioxin risks uncertain (based on 1 study) •Almost 80% of the risk calculated with historic data is due to a nutrient •Some dioxin and RDX dietary risks due to nondetects
Soil Fauna HI=224.7C HI=627.1H	Cr (55) Cu (20) Fe (16) PAH (5)	Cr (95)	Direct contact (100%)	Direct contact (100%)	Potential high risk	•Important prey base	•Site could support populations	•Chromium data limited to one benchmark (weak) • Copper and iron are nutrients
Plants HI=177.4C HI=44.3H	Al (6) Cu (21) PAH (43) Tl (10) Zn (7)	As (6) Cr (7) Cu (8) PAH (15) Sb (5) V (33) Zn (16)	Direct contact (100%)	Direct contact (100%)	Potential moderate risk	•Community not similar to RSA; physically altered by grading	•Site could support populations	• Zinc TBV 50 to 400 mg/kg, so quite variable •Thallium HQs based on nondetects

[a]HI=Total absolute hazard index. [b]C=Based on current data set. [c]H=Based on historic data set. [d]NA=Not applicable.

Weight-of-evidence (WOE) high & for most receptors, approached that of the reference study area (RSA); WOE ≥ RSA for plants and soil fauna.

Much of the mammalian HI value is the result of the nutrients iron and copper. Because mammals integrate their exposure throughout the home range, chronic daily intakes are expected to be less than predicted by the risk assessment, since the risk assessment used a high exposure point concentration (biased due to sampling design, and statistically due to use of maxima or UCL95 values) and 95th percentiles for exposure estimates. However, because numerous receptors are potentially affected, this area presents a likely ecological risk.

Conclusions: This area is likely to pose excessive or unacceptable risks to passerine birds, small mammals, soil fauna and plants based on absolute and relative HIs, and size of site.

Table 7-100. Risk Description and Interpretation: SWMU 13 - Tire Disposal Area

SWMU 13	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=7.3H[b]	Not sampled	Cr (87) Pb (8) Phthalate(5)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 30 acres, site could support small populations	•Cr less toxic in avian field studies than in laboratory tests
Am. Kestrel HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=0.11H	Not sampled	None	NA	NA	NA	NA	NA	NA
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=28.8H	Not sampled	Cr (100)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Unlikely to support populations	•Cr risks based on one study (weak)

Table 7-100. Risk Description and Interpretation: SWMU 13 - Tire Disposal Area (continued)

SWMU 13	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=0.4H	Not sampled	None	NA	NA	NA	NA	NA	NA

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) below average for all receptors; all WOE < reference study area (RSA). Absence of dietary intakes may underestimate risk.

The major COPC is chromium for which toxicity is uncertain. Avian species exhibited lower toxicity in the only available field study. At 200 mg/kg in soil, growth inhibition for plants was only 23-36% reduced relative to controls. Therefore, vegetation is expected to survive adequately. The risks to soil fauna are based on one study.

Conclusions: This area is not likely to pose excessive or unacceptable risks to TEAD receptors, based on low observed relative risk.

Table 7-101. Risk Description and Interpretation: SWMU 14 - Sewage Lagoons-Terrestrial

SWMU 14 Terrestrial	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=224.4H[b]	Not sampled	Cd (20) Cr (36) Pb (5) Tl (14) Zn (15)	NA[c]	Soil (100%)	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Could provide chronic exposure to several breeding pairs	•Cr less toxic in avian field studies than in laboratory tests •Relative risks low.
Am. Kestrel HI=0.2H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=11.1H	Not sampled	Ba (7) Cu (21) Pb (14) Tl (29) Zn (15)	NA	Soil (100%)	Potential low risk	•Represents Special Status species •Important prey item	•Site may support populations	•Over 50% of the risk is due to nutrients
Mule Deer HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.2H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=383.6H	Not sampled	Cr (96)	NA	Direct contact (100%)	Potential high risk	•Important prey base	•Site may support populations	•Data limited to one study (weak)

Table 7-101. Risk Description and Interpretation: SWMU 14 - Sewage Lagoons-Terrestrial (continued)

SWMU 14 Terrestrial	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=116.9H	Not sampled	Ag (41) Cd (12) Hg (5) Tl (9) Zn (22)	NA	Direct contact (100%)	Potential moderate risk	•Vegetated with native & nonnative species •Plants provide community structure/ habitat	•Site may support populations	•Silver risks based on one suggested TBV(weak) •Zinc TBV 50 to 400 mg/kg, so quite variable

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable

Weight-of-evidence (WOE) above average for all receptors; WOE> reference study area (RSA) for plants and soil fauna. Absence of dietary intakes may underestimate risk.

In arid desert environments, permanent lentic habitats are quite valuable to various species of wildlife and birds (Cooperider et al., 1986). The benefits of this unique aquatic habitat outweigh any potential risks due to the low levels of contaminants that occur. The Sewage Lagoons likely act as an attractant to wildlife.

Conclusions: This area is not likely to pose excessive or unacceptable risks to plants or animals compared to the benefits gained by supplying a permanent water source. All relative risks are low.

Table 7-102. Risk Description and Interpretation: SWMU 14 - Sewage Lagoons (Aquatic)

SWMU 14 Aquatic	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Duck HI[a]=0.3H[b]	Not Sampled	None	NA[c]	NA		NA	NA	NA
Duckling HI=20.1H	Not sampled	Cd (7) Cr (35) Fe (10) Pb (10) Se (9) Tl (15)	NA	Sediment (93%) Diet (7%)	Low (absolute HQs range from 1.4 to 7.0).	•Habitat is significant; any toxic effects likely to be at individual, not population level	•Habitat size could support populations if forage or prey adequate.	•Cd TBV is based on lesions, which have no certain link to health or population effects •Cr less toxic in avian field studies than in laboratory tests • Iron and selenium are also nutrients
Shorebird HI=62.6H	Not sampled	Cd (22) Cr (23) Fe (8) Pb (7) Se (7) Tl (12) Zn (12)		Sediment (97%) Diet (3%)	Low (absolute HQs range from 4.3 to 14.4).	•Habitat is significant; any toxic effects likely to be at individual, not population level	•Habitat size could support populations if forage/prey adequate	•Cd TBV is based on lesions, which have no certain link to health or population effects •Cr less toxic in avian field studies than in laboratory tests • Iron , selenium, and zinc are nutrients
Eagle HI=0.007H	Not sampled	None	NA	NA	NA	NA	NA	NA

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

WOE not evaluated for aquatic ecosystem.

Conclusions: This area does not represent a significant or relevant risk to plants or animals compared to the benefits gained by supplying a permanent water source. The risk estimates are uncertain due to uncertainties in the TBVs; while some isolated individuals may be adversely affected, waterfowl and shorebird populations as a whole will benefit. The Sewage Lagoons likely act as an attractant to wildlife.

Table 7-103. *Risk Description and Interpretation: SWMU 19 - AED Demilitarization Test Facility*

SWMU 19	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=172.1H[b]	Not Sampled	Cr (5) Fe (30) Zn (56)	NA[c]	Soil (100%)	Potential moderate risk	•Some passerines are permanent residents; site still active •Represents Special Status species	•Site large enough to support several breeding pairs	•Over half of the risk is due to nutrients
Am. Kestrel HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=46.2H	Not sampled	Cu (5) Fe (82) Zn (10)	NA	Soil (100%)	Potential moderate risk	•Important prey item •Represents Special Status species	•Site could support small populations	•Over half of the risk is due to nutrients
Mule Deer HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.7H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=89.7H	Not sampled	Cr (43) Cu (5) Fe (31) Zn (20)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Site could support small populations	•Over half of the risk is due to nutrients

Table 7-103. Risk Description and Interpretation: SWMU 19 - AED Demilitarization Test Facility (continued)

SWMU 19	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=78.7H	Not sampled	Cu (5) Zn (93)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Zinc toxicity variable; at soil pH >7.4, zinc not available. Deficiency indicated at 16-20 ppm in plant tissues; normal up to 120 ppm[1]

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable. [1]NRC, 1979. Zinc, Subcommittee on Zinc. University Park Press, Baltimore, MD. 471 pages.

Weight-of-evidence (WOE) below average for all receptors; all WOE < reference study area (RSA). Absence of dietary intakes may underestimate risk.

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks to TEAD receptors based on the COPCs that are the risk drivers, and the observed relative risks.

Table 7-104. Risk Description and Interpretation: SWMU 20 -AED Deactivation Furnace Site

SWMU 20	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=173.7H[b]	Not sampled	Cd (5) Cr (10) Fe (13) Pb (41) Tl (13) Zn (11)	NA[c]	Soil (100%)	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations; exposure could be chronic	•Numerous metals •24% of risk due to nutrients
Am. Kestrel HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=34.2H	Not sampled	Cu (8) Fe (48) Pb (28) Tl (7)	NA	Soil (100%)	Potential low risk	•Important prey item •Represents Special Status species	•Could support small populations with chronic exposure	•Over half the risk due to nutrients
Mule Deer HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=1.0H	Not sampled	Cu (5) Fe (50) Pb (30) Tl (6)	NA	Soil (100%)	Potential low risk	•Common prey item	•Support individuals with intermittent exposure	•Over half the risk due to nutrients
Kit Fox HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=100.6H	Not sampled	Cr (76) Cu (6) Fe (12)	NA	Direct contact (100%)	Potential moderate risk	•Important prey base	•Could support populations	•Cr risk very uncertain

Table 7-104. Risk Description and Interpretation: SWMU 20 -AED Deactivation Furnace Site (continued)

SWMU 20	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=38.8H	Not sampled	Cd (7) Cu (13) Pb (8) Sb (8) Tl (20) Zn (37)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Numerous metals present risk; however, low risk relative to RSA

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) above average for all receptors; WOE =reference study area (RSA) for soil fauna. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors since its active status may deter ecological receptors from continuous use of area, and because much of the risk is due to the nutrient, iron.

Table 7-105. Risk Description and Interpretation: SWMU 21 - AED Deactivation Furnace Building

SWMU 21	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=148.3C[b] HI=1047.5H[c]	Cd (15) Diox (17) Fe (6) Pb (27) Tl (14) Zn (9)	Cd (13) Cr (28) Pb (36) Zn (10)	Soil (47%) Diet (53%)	Soil (100%)	Potential high risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site not large enough to support populations; exposure not chronic	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Thallium HQs based on nondetects •Some Cd, Pb, Zn, and dioxin dietary risks due to nondetects.
Am. Kestrel HI=0C HI=0.1H	None	None	NA[d]	NA	NA	NA	NA	NA
Great Horned Owl HI=0C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=61.8C HI=134.1H	Cu (7) Diox (43) Fe (11) Pb (10) RDX (6) TNT (6)	Cu (8) Fe (11) Pb (21) TNT (50)	Soil (14%) Diet (86%)	Soil (100%)	Potential moderate risk	•Important prey item • Represents Special Status species	•Exposure not chronic; site too small to support more than a few individuals	•Dioxin risks uncertain (based on 1 study) •Munitions based on sublethal endpoints; •Dioxin TBV uncertain •Some RDX, TNT and dioxin dietary risks due to nondetects
Mule Deer HI=0.02C HI=0.04H	None	None	NA	NA	NA	NA	NA	NA

Table 7-105. Risk Description and Interpretation: SWMU 21 - AED Deactivation Furnace Building (continued)

SWMU 21	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Jackrabbit HI=0.3C HI=0.4H	None	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0C HI=0.03H	None	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=67.3C HI=3470.2H	Cr (65) Cu (8) Fe (15)	Cr (93)	Direct contact (100%)	Direct contact (100%)	Potential high risk	•Important prey base; loss of invertebrates on area this small unlikely to impact predators	•Site not large enough to support populations	•Cr risk uncertain •Fe is a nutrient
Plants HI=65.5C HI=2024.3H	Al (17) Cd (10) Cu (7) Sb (8) Tl (26) V (10) Zn (15)	Cd (5) TNT (74) Zn (9)	Direct contact (100%)	Direct contact (100%)	Potential high risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Numerous COPCs •Thallium HQs based on nondetects

[a]HI=Total absolute hazard index. [b]C=Based on current data set. [c]H=Based on historic data set. [d]NA=Not applicable.

Weight-of-evidence (WOE) high, and for most receptors, approached that of the reference study area (RSA); WOE >RSA WOE for passerine birds, soil fauna, and plants.

Conclusions: This area poses the potential for excessive or unacceptable ecological risks to passerine birds, small mammals, soil fauna and plants despite its small size. Risks to Special Status pocket mouse could be underestimated since munitions can accumulate in plants; deer mouse diet may underestimate pocket mouse.

Table 7-106. Risk Description and Interpretation: SWMU 22 - Bldg. 1303 Washout Pond

SWMU 22	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=8.1H[b]	Not sampled	Cr (20) Fe (63) Zn (9)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site not large enough to support small populations	•Risks to birds may be underestimated due to lack of avian TBVs •Over 70% of risk due to nutrients
Am. Kestrel HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=31.7H	Not sampled	Fe (7) RDX (6) TNT (86)	NA	Soil (100%)	Potential low risk	•Important prey item •Represents Special Status species	•Site not large enough to support populations •No chronic exposure	•Munitions TBVs based on sublethal endpoints
Mule Deer HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=63.3H	Not sampled	Cr (71) Fe (26)	NA	Direct contact (100%)	Potential low risk	•Important prey base; loss in area this size would not cause predator impacts	•Site too small to support populations	•Chromium risks based on one study (weak)

Table 7-106. Risk Description and Interpretation: SWMU 22 - Bldg. 1303 Washout Pond (continued)

SWMU 22	**Risk Drivers (% COPC contribution)**		**Driving Pathway**		**Risk Interpretation**	**Relevance**		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=1554.8H	Not sampled	TNT (99)	NA	Direct contact (100%)	Potential high risk	•Plants provide community structure/ habitat	•Site too small to support populations	•Uncertain benchmark based on one leachate study

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) below average for all receptors, except WOE = reference study area (RSA) for plants. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors due to its small size. Impacts to plants and soil fauna would not measurably impact the other receptors due to small spatial scale.

Table 7-107. Risk Description and Interpretation: SWMU 23 - Bomb & Shell Reconditioning Building

SWMU 23	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=115H[b]	Not sampled	Cd (5) Cr (38) Fe (26) Pb (6) PCB (12) Zn (9)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Exposure most likely to be intermittent	•Almost 40% of risk due to nutrients
Am. Kestrel HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=25.6H	Not sampled	Fe (87)	NA	Soil (100%)	Potential low risk	•Represents Special Status species •Important prey item	•Exposure most likely to be intermittent	•Risk due to a nutrient
Mule Deer HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0.03H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=216.5H	Not sampled	Cr (91) Fe (8)	NA	Direct contact (100%)	Potential high risk	•Prey items; population loss in this small area not relevant	•Site large enough to support small populations	•Chromium risks very uncertain

Table 7-107. Risk Description and Interpretation: SWMU 23 - Bomb & Shell Reconditioning Building (continued)

SWMU 23	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=15.2H	Not sampled	As (13) Cd (12) Cr (7) Zn (53)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Over 50% of risk due to a nutrient

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) just below average for most receptors; WOE < reference study area (RSA) for all receptors. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors due to small size and low relative risk to all receptors except soil fauna.

Table 7-108. Risk Description and Interpretation: SWMU 25 - Battery Shop

SWMU 25	**Risk Drivers (% COPC contribution)**		**Driving Pathway**		**Risk Interpretation**	**Relevance**		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=157.1H[b]	Not sampled	Cr (10) Fe (58) Pb (25)	NA[c]	Soil (100%)	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 5.2 acres, site large enough to support small populations; exposure likely intermittent	•Risk primarily due to a nutrient
Am. Kestrel HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=75.4H	Not sampled	Fe (89) Pb (7)	NA	Soil (100%)	Potential moderate risk	•Important prey item •Represents Special Status species	•Site large enough to support small populations; exposure likely intermittent	•Risk primarily due to a nutrient
Mule Deer HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=1.4H	Not sampled	Fe (89) Pb (7)	NA	Soil (100%)	Potential low risk	•Common prey item	•Exposure at site intermittent due to small size	•Risk due primarily to a nutrient
Kit Fox HI=0.H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=127.6H	Not sampled	Cr (58) Fe (39)	NA	Direct contact (100%)	Potential moderate risk	•Important prey base	•Site large enough to support small populations	•Almost 40% of risk due to a nutrient

Table 7-108. Risk Description and Interpretation: SWMU 25 - Battery Shop (continued)

SWMU 25	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=41.7H	Not sampled	Ag (5) Hg (5) V (64) Zn (7)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Several COPCs •Zn is a nutrient.

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) below average for most receptors; WOE < RSA for all receptors. Absence of dietary intakes may underestimate risk. Most of the risk is due to iron.

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks to TEAD receptors based on risks relative to the RSA.

Table 7-109. Risk Description and Interpretation: SWMU 26 - DRMO Storage Yard

SWMU 26	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=104.1H[b]	Not sampled	Cr (32) Pb (13) Tl (12) Zn (34)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations	•Several COPCs but low relative risk
Am. Kestrel HI=0.7H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.04H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.04H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=6.9H	Not sampled	Cu (23) Pb (27) Tl (19) Zn (25)	NA	Soil (100%)	Potential low risk	•Important prey item • Represents Special Status species	•Could support populations, chronic exposure	•Several COPCs but low relative risk •Zn is a nutrient
Mule Deer HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=1.2H	Not sampled	Cu (17) Pb (33) Tl (21) Zn (19)	NA	Soil (100%)	Potential low risk	•Common prey item	•Site could support numerous individuals with chronic exposure	•Several COPCs but low relative risk •Zn is a nutrient
Kit Fox HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=162.5H	Not sampled	Cr (93)	NA	Direct contact (100%)	Potential moderate risk	•Important prey base	•Site could support populations	•Chromium risks highly uncertain

Table 7-109. Risk Description and Interpretation: SWMU 26 - DRMO Storage Yard (continued)

SWMU 26	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=39.1H	Not sampled	Cu (7) Tl (11) Zn (69)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Zn and Cu are nutrients

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) below average and below the reference study area (RSA) for all receptors. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors based on the low relative risks to all receptors except soil fauna.

Table 7-110. Risk Description and Interpretation: SWMU 27 - RCRA Container Storage Area

SWMU 27	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=226.7H[b]	Not sampled	Cd (6) Cr (60) Pb (10) Tl (17) Zn (5)	NA[c]	Soil (100%)	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site too small to support small populations	•Most risk due to chromium, which data suggest is not as toxic under field conditions as it appears in laboratories
Am. Kestrel HI=0.03H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=8.8H	Not sampled	Cr (6) Pb (34) Tl (46) Zn (6)	NA	Soil (100%)	Potential low risk	•Important prey item • Represents Special Status species	•Site too small to support population	•Lead a known toxicant, but relative risks low •Zn is a nutrient
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.04H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=625.4H	Not sampled	Cr (98)	NA	Direct contact (100%)	Potential high risk	•Important prey base	•Site large enough to support small populations	•Chromium risks highly uncertain

Table 7-110. Risk Description and Interpretation: SWMU 27 - RCRA Container Storage Area (continued)

SWMU 27	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=50.1H	Not sampled	Cd (9) Cr (7) Hg (34) Tl (27) Zn (17)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Zn is a nutrient

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) well below average and < reference study area (RSA) for all receptors. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors based on low relative risk to all receptors except soil fauna and small spatial size.

Table 7-111. Risk Description and Interpretation: SWMU 28 - 90-Day Drum Storage Area

SWMU 28	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=73.4H[b]	Not sampled	Cd (10) Cr (17 Pb (6) Tl (54) TPHC (11)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations	•Several COPCs but low relative risk
Am. Kestrel HI=0.03	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=5.2H	Not sampled	Pb (12) Tl (78)	NA	Soil (100%)	Potential low risk	•Important prey item •Represents Special Status species	•Could support numerous individuals with frequent or chronic exposure	•Thallium TBVs are adequate for rodents.
Mule Deer HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=58.6H	Not sampled	Cr (98)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Could support populations	•Risk to chromium uncertain •Low relative risk

Table 7-111. Risk Description and Interpretation: SWMU 28 - 90-Day Drum Storage Area (continued)

SWMU 28	**Risk Drivers (% COPC contribution)**		**Driving Pathway**		**Risk Interpretation**	**Relevance**		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=18.6H	Not sampled	As (10) Cd (12) Tl (74)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Arsenic is phytotoxic

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) well below average and < reference study area (RSA) for all receptors. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors based on risks relative to the RSA.

Table 7-112. Risk Description and Interpretation: SWMU 29 - Drum Storage Area

SWMU 29	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=37.7H[b]	Not sampled	Cr (61) DDT (7) Pb (7) TPHC (8) Zn (13)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations	•Absolute risks likely underestimated due to absence of dietary pathway and presence of DDT.
Am. Kestrel HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=0.9H	Not sampled	None	NA	NA	NA	NA	NA	NA
Mule Deer HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=105.3H	Not sampled	Cr (99)	NA	Direct contact (100%)	Potential moderate risk	•Important prey base	•Site could support populations	•Chromium risk uncertain

Table 7-112. Risk Description and Interpretation: SWMU 29 - Drum Storage Area (continued)

SWMU 29	**Risk Drivers (% COPC contribution)**		**Driving Pathway**		**Risk Interpretation**	**Relevance**		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=6.3H	Not sampled	As (26) Cr (9) Zn (60)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Arsenic is phytotoxic •Zn is a nutrient

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) below average and < reference study area (RSA) for all receptors. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors based on low relative rise to all receptors.

Table 7-113. Risk Description and Interpretation: SWMU 30 - Old Industrial Wastewater Lagoon

SWMU 30	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=113.4H[b]	Not sampled	Cd (6) Cr (51) Fe (28) Pb (7) Zn (5)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations	•Several COPCs •Relative risks low •1/3 of risk due to nutrients
Am. Kestrel HI=0.5H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.03H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.03H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=35.5H	Not sampled	Al (25) Fe (66)	NA	Soil (100%)	Potential low risk	•Important prey item • Represents Special Status species	•Site could support populations	•Dietary pathway not likely to contribute even if evaluated •Most of risk due to a nutrient
Mule Deer HI=0.5H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=4.7H	Not sampled	Al (17) Fe (75)	NA	Soil (100%)	Potential low risk	•Common prey item	•Site could provide intermittent exposure	•Risk primarily due to a nutrient
Kit Fox HI=0.5H	Not sampled	None	NA	NA	NA	NA	NA	NA

Table 7-113. Risk Description and Interpretation: SWMU 30 - Old Industrial Wastewater Lagoon (continued)

SWMU 30	**Risk Drivers (% COPC contribution)**		**Driving Pathway**		**Risk Interpretation**	**Relevance**		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Soil Fauna HI=287.7H	Not sampled	Cr (91) Fe (6)	NA	Direct contact (100%)	Potential high risk	•Important prey base	•Site large enough to support populations	•Cr risks suspect. TBV is weak. •HQs > 1 occur at nearly every site and RSA, suggesting this is due to ambient conditions
Plants HI=45.5H	Not sampled	Al (50) Cd (5) V (27) Zn (9)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support populations	•Al risks to plants suspect due to highly variable TBVs. •Al less toxic in alkaline soils

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of evidence (WOE) above average for all receptors; WOE = reference study area (RSA) for plants and soil fauna. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors.

Table 7-114. Risk Description and Interpretation: SWMU 31 - Former Transformer Boxing Site

SWMU 31	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=1.8H[b]	Not sampled	Pb (99)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations	•Lead a known avian toxicant •Relative and absolute risks low
Am. Kestrel HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=0.3H	Not sampled	None	NA	NA	NA	NA	NA	NA
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA
Plants HI=0.1H	Not sampled	None	NA	NA	NA	NA	NA	NA

[a]HI=Total absolute hazard index. [b]H=Based on historic data set. [c]NA=Not applicable.

Weight-of-evidence (WOE) low for all receptors and <reference study area (RSA) for all receptors. Absence of dietary intakes may underestimate risk. Absolute risk very low.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors.

Table 7-115. Risk Description and Interpretation: SWMU 32 - PCB Spill Site

SWMU 32	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=4.5H[b]	Not sampled	Cd (14) Cr (69) Pb (12)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site too small to support populations	•Lead a known avian toxicant •Cr less toxic under field conditions than indicated by laboratory data
Am. Kestrel HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=0.07H	Not sampled	None	NA	NA	NA	NA	NA	NA
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=85.2H	Not sampled	Cr (99)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Site too small to support populations	•Chromium risks uncertain
Plants HI=3.5H	Not sampled	As (44) Cd (33) Cr (13) Cu (7)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site too small to support small populations	•Cd TBVs generally good although will vary with soil pH

[a]HI= Total absolute hazard index. [b]C=Current data. [c]H=Historic data. [d]NA=Not applicable.

Weight-of-evidence (WOE) low for all receptors and < reference study area (RSA). Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors based on low relative risk.

Table 7-116. Risk Description and Interpretation: SWMU 34 - Pesticide/Herbicide Storage Building

SWMU 34	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=49.7H[b]	Not sampled	DDT (59) E_I (15) Tl (12)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 0.1 acre, site too small to support more than a few individuals.	•Major risk drivers are OCPs; therefore, absolute risks could be underestimated due to lack of dietary pathway; however, site is too small to supply the only prey/forage base
Am. Kestrel HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=0.8H	Not sampled	None	NA	NA	NA	NA	NA	NA
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=49.9H	Not sampled	Cr (93) Zn (5)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Site too small to support more than a few individuals	•Cr risks uncertain

Table 7-116. Risk Description and Interpretation: SWMU 34 - Pesticide/Herbicide Storage Building (continued)

SWMU 34	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=25.2H	Not sampled	As (5) Tl (50) Zn (37)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site too small to support more than a few individuals	•Arsenic is phytotoxic • Low relative risk.

[a]HI= Total absolute hazard index. [b]H=Historic data. [c]NA=Not applicable.

Weight-of-evidence (WOE) below average for all receptors, and all WOE < reference study area (RSA); this was primarily a result of fewer samples. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors due to its small size and low relative risk.

Table 7-117. Risk Description and Interpretation: SWMU 35 - Wastewater Spreading Area

SWMU 35	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	Current	Historic	Current	Historic		Ecological	Spatial	Toxicological
Passerines HI[a]=85.5H[b]	Not sampled	E_I (43) Fe (41)	NA[c]	Soil (100%)	Low potential risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations	•Absolute risk could be underestimated because dietary pathway not included for endrin_isodrin (E_I) •Iron is a nutrient
Am. Kestrel HI=0.3H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=27.9H	Not sampled	Fe (93)	NA	Soil (100%)	Low potential risk	•Important prey item •Represents Special Status species	•Site could support populations	•Risk is due to a nutrient •Low relative risk
Mule Deer HI=0.3H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=3.3H	Not sampled	Fe (93)	NA	Soil (100%)	Low potential risk	•Common prey item	•Site could support several individuals with frequent exposure	•Risk is due to a nutrient •Low relative risk
Kit Fox HI=0.3H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=21H	Not sampled	As (5) Fe (91)	NA	Direct contact (100%)	Low potential risk	•Important prey base	•Site could support population	•Risk is due to a nutrient •Low relative risk

Table 7-117. Risk Description and Interpretation: SWMU 35 - Wastewater Spreading Area (continued)

SWMU 35	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=9.3H	Not sampled	As (66) Zn (23)	NA	Direct contact (100%)	Low potential risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Arsenic is phytotoxic; but area has revegetated

[a]HI=Total absolute hazard index. [b]H=Historic. [c]NA=Not applicable.

Weight-of-evidence (WOE) below average and < reference study area (RSA) for all receptors.

Absence of dietary intakes may underestimate risk. Much of the risk is due to the nutrient iron.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors because all relative risks are low.

Table 7-118. Risk Description and Interpretation: SWMU 36 - Old Burn Staging Area

SWMU 36	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=72.2H[b]	Not sampled	Cr (12) Cu (5) Fe (45) Pb (27) Zn (9)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site too small to support populations	•Several COPCs, but low relative risk •Cu, Fe, and Zn are nutrients
Am. Kestrel HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=29.5H	Not sampled	Cu (5) Fe (82) Pb (9)	NA	Soil (100%)	Potential moderate risk	•Important prey item • Represents Special Status species	•Site large enough to support small populations	•Most of the risk is due to nutrients
Mule Deer HI=0.03H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.3H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0.03H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=60.5H	Not sampled	Cr (62) Cu (5) Fe (29)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Site large enough to support small populations	•The Cr risks are doubtful due to uncertain toxicity data • Fe and Cu are nutrients

Table 7-118. Risk Description and Interpretation: SWMU 36 - Old Burn Staging Area (continued)

SWMU 36	**Risk Drivers (% COPC contribution)**		**Driving Pathway**		**Risk Interpretation**	**Relevance**		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=10H	Not sampled	As (10) Cu (26) Pb (8) Zn (47)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Much of the risk is due to nutrients

[a]HI=Total absolute hazard index. [b]H=Historic. [c]NA=Not applicable.

Weight-of-evidence (WOE) below average and <reference study area (RSA) for all receptors.

Absence of dietary intakes may underestimate risk.

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks to TEAD receptor based on the low relative risks and small size.

Table 7-119. Risk Description and Interpretation: SWMU 37 - Contaminated Waste Processor

SWMU 37	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=158.3C[b] HI=24.4H[c]	Diox (39) Fe (10) Tl (31) Zn (5)	Diox (35) Pb (7) Zn (55)	Soil (49%) Diet (51%)	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site too small to support populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Relative risk low •Thallium HQs based on nondetects •Some dioxin soil ingestion risks due to nondetects (current) •Some dioxin dietary risks due to nondetects
Am. Kestrel HI=0.1C HI=0H	None	None	NA[d]	NA	NA	NA	NA	NA
Great Horned Owl HI=0C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.01C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.01C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=129.4C HI=27.9H	Diox (57) Fe (13) RDX (7) TNT (5)	Diox (96)	Soil (17%) Diet (83%)	Soil (100%)	Potential moderate risk	•Important prey item •Represents Special Status species	•Too small to support populations	• May bio-accumulate dioxins; but not munitions •Dioxin risks uncertain (based on 1 study) •Some RDX, TNT and dioxin dietary risks due to nondetects

Table 7-119. Risk Description and Interpretation: SWMU 37 - Contaminated Waste Processor (continued)

SWMU 37	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Mule Deer HI=0.1C HI=0.01H	None	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=1.0C HI=0.1H	Diox (68) Fe (10) RDX (12)	None	Soil (7%) Diet (93%)	NA	Potential low risk	•Common prey item	•Site too small to support populations	• May bio-accumulate dioxins, but not munitions •Dioxin risks uncertain (based on 1 study)
Kit Fox HI=0.1C HI=0.01H	None	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=32.0C HI=2.7H	Al (5) Cr (67) Fe (26)	Zn (94)	Direct contact (100%	Direct contact (100%	Potential low risk	•Important prey base	•Site too small to be relevant	•Over 1/4 of the risk is due to nutrients
Plants HI=33.3C HI=11.1H	Al (20) Tl (52) V (17)	Zn (92)	Direct contact (100%)	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site too small to support populations	•Low relative risk •Thallium HQs based on nondetects

[a]HI= Total absolute hazard index. [b]C=Current data. [c]H=Historic data. [d]NA=Not applicable.

Weight-of evidence (WOE) high and for most receptors, approached that of the reference study area (RSA).

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks to TEAD receptors based on relative risk and SWMU size.

Table 7-120. Risk Description and Interpretation: SWMU 38 - Industrial Wastewater Treatment Plant

SWMU 38	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=17H[b]	Not sampled	Pb (5) Tl (90)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site too small to support populations	•Lead a known avian toxicant •Relative and absolute risks low
Am. Kestrel HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=1H	Not sampled	Tl (90)	NA	Soil(100%)	Potential low risk	•Important prey item •Represents Special Status species	•Site too small to support populations	
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=0.5H	Not sampled	None	NA	NA	NA	NA	NA	NA

Table 7-120. Risk Description and Interpretation: SWMU 38 - Industrial Wastewater Treatment Plant (continued)

SWMU 38	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=11.6H	Not sampled	Tl (90)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	

[a]HI= Total absolute hazard index. [b]H=Historic data. [c]NA=Not applicable.

Weight-of-evidence (WOE) low for all receptors and all < reference study area (RSA); this was primarily a result of fewer samples. Absence of dietary intakes may underestimate risk.

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks to TEAD receptors.

Table 7-121. Risk Description and Interpretation: SWMU 40 - AED Test Range

SWMU 40	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=44.5H[b]	Not sampled	Cr (17) Fe (54) Pb (13) Zn (5)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•At 60 acres, site large enough to support populations	•Much of risk is due to nutrients •Low relative risk
Am. Kestrel HI=0.3H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0.01H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=38.6H	Not sampled	Fe (46) RDX (46)	NA	Soil (100%)	Potential low risk	•Represents Special Status species •Important prey item	•Site large enough to support populations	•Absolute risks to herbivores underestimated due to likelihood of munitions in diet •Much of risk is due to a nutrient
Mule Deer HI=0.8H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=8.4H	Not sampled	Fe (46) RDX (49)	NA	Soil (100%)	Potential low risk	•Common prey item	•Site could provide frequent exposure	•Risks to herbivores underestimated due to likelihood of munitions in diet. •Much of risk is due to a nutrient
Kit Fox HI=0.8H	Not sampled	None	NA	NA	NA	NA	NA	NA

Table 7-121. Risk Description and Interpretation: SWMU 40 - AED Test Range (continued)

SWMU 40	**Risk Drivers (% COPC contribution)**		**Driving Pathway**		**Risk Interpretation**	**Relevance**		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Soil Fauna HI=50H	Not sampled	Cr (71) Fe (26)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Site large enough to support populations	•Cr risks very uncertain. Cr risks occur so frequently they may be ambient •About 25% of risk is due to a nutrient
Plants HI=17.2H	Not sampled	As (10) V (68) Zn (10)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support populations	•Low relative risk •Zinc is a nutrient

[a]HI= Total absolute hazard index. [b]H=Historic data. [c]NA=Not applicable.

Weight-of-evidence (WOE) above average for most receptors; all WOE < reference study area (RSA) except for soil fauna (WOE = RSA WOE); this was primarily a result of fewer samples. Absence of dietary intakes may underestimate risk particularly for herbivores.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors due to low relative risk.

Table 7-122. Risk Description and Interpretation: SWMU 42 - Bomb Washout Facility

SWMU 42	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI(a)=239.3C(b) HI=875.4H(c)	Cd (5) Diox (24) Fe (6) Pb (29) Tl (20)	Ba (6) Cr (6) Cu (5) Pb (63) Tl (8)	Soil (50%) Diet (50%)	Soil (100%)	Potential high risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Thallium HQs based on nondetects (current) •Some Ba, Cd, Pb, and dioxin dietary risks due to nondetects
Am. Kestrel HI=4.5C HI=3.7H	Cd (6) Diox (56) Pb (8) Tl (9) Zn (7)	Ba (12) Cr (12) Cu (9) Fe (8) Pb (25) Tl (16) Zn (8)	Soil (18%) Diet (82%)	Soil (100%)	Potential low risk	•Represents Special Status species	•Site could support numerous pairs	•Numerous metal COPCs • Relative and absolute risks low •Dioxin risks uncertain (based on 1 study) •Thallium HQs based on nondetects (current)
Great Horned Owl HI=0.3C HI=0.2H	None	None	NA(d)	NA	NA	NA	NA	NA
Golden Eagle HI=0.5C HI=0.4H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.5C HI=0.3H	None	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=83.8C HI=168.8H	Al (6) Ba (10) Diox (6) Fe (17) Pb (10) RDX (11) Sb (12) Tl (6) TNT (7)	Ba (9) Cu (10) Diox (7) Fe (14) Pb (44) Sb (9)	Soil (42%) Diet (58%)	Soil (100%)	Potential high risk	•Important prey item •Represents Special Status species	•Site could support populations with chronic exposure	•Numerous COPCs •Dioxin risks uncertain (based on 1 study) •Thallium HQs based on nondetects •Some RDX and TNT dietary risks due to nondetects

Table 7-122. Risk Description and Interpretation: SWMU 42 - Bomb Washout Facility (continued)

SWMU 42	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Mule Deer HI=2.8C HI=3.8H	Ba (16) Diox (7) Fe (13) Pb (12) RDX (20) Sb (9) TNT (7)	Ba (10) Cu (7) Diox (7) Fe (16) Pb (47) Sb (9)	Soil (29%) Diet (71%)	Soil (100%)	Potential low risk	•No similar Special Status species	•Site could support populations with frequent exposure	•Numerous COPCs •Dioxin risks uncertain (based on 1 study) •Some RDX dietary risks due to nondetects
Jackrabbit HI=29.9C HI=41.3H	Ba (16) Diox (7) Fe (14) Pb (12) RDX (21) Sb (9) TNT (9)	Ba (10) Cu (7) Diox (7) Fe (15) Pb (46) Sb (9)	Soil (28%) Diet (72%)	Soil (100%)	Potential moderate risk	•Common prey item	•Site could support populations with frequent exposure	•Numerous COPCs •Dioxin risks uncertain (based on 1 study) •Some RDX and TNT dietary risks due to nondetects
Kit Fox HI=7.9C HI=3.9H	Diox (56) Pb (9) Sb (26)	Ba (10) Cu (5) Diox (7) Fe (15) Pb (46) Sb (9)	Soil (10%) Diet (90%)	Soil (100%)	Potential low risk	•Represents Special Status species	•Site large enough to support populations with frequent exposures	•Numerous COPCs •Dioxin risks uncertain (based on 1 study) •Some dioxin, Sb, and Pb dietary risks due to nondetects
Soil Fauna HI=46.8C HI=307.3H	Cr (74) Fe (14)	Cr (74) Cu (12) Fe (6) Pb (6)	Direct contact (100%	Direct contact (100%	Potential high risk	•Important prey base	•Site could support populations	•Risks uncertain since Cr TBV based on 1 study (weak) •Cu and Fe are nutrients
Plants HI=84.7C HI=194.3H	Al (9) Tl (20) V (8)	Ba (7) Cu (16) Pb (12) Sb (34) Tl (12) Zn (13)	Direct contact (100%)	Direct contact (100%)	Potential moderate risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Several COPCs •Thallium HQs based on nondetects (current)

[a]HI=Total absolute hazard index. [b]C=Current data. [c]H=Historic data. [d]NA=Not applicable.

Weight-of-evidence (WOE) exceeds reference study area (RSA) for many receptors including plants and soil fauna.

Conclusions: This area is likely to pose excessive or unacceptable risks to birds, mammals, soil fauna and plants.

Table 7-123. Risk Description and Interpretation: SWMU 45 - Stormwater Discharge Area

SWMU 45	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=230.4C[b] HI=162.9H[c]	Cd (5) Cr (16) Diox (5) Fe (15) Pb (18) Tl (21) Zn (8)	Cr (17) DDT (29) Pb (10) Tl (29) Zn (6)	Soil (80%) Diet (20%)	Soil (100%)	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations of several individuals	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Dietary risks not a large contributor •Thallium HQs based on nondetects (current) •Some dioxin soil ingestion risks due to nondetects •Almost 1/4 of risk due to nutrients (current)
Am. Kestrel HI=0.8C HI=0.2H	None	None	NA[d]	NA	NA	NA	NA	NA
Great Horned Owl HI=0.0C HI=0H	None	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0.0C HI=0.01H	None	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0.0C HI=0.01H	None	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=90.3C HI=12.5H	Al (10) Diox (6) Fe (31) RDX (17) Tl (6) TNT (9)	A_D (15) CLDN (6) Co (5) Pb (18) Tl (39)	Soil (51%) Diet (49%)	Soil (100%)	Potential moderate risk	•Important prey item •Represents Special Status species	•Site could support frequent or chronic exposures	•Thallium HQs based on nondetects (current) •Dioxin risks uncertain (based on 1 study) •About 1/3 of risk due to nutrient (current) •Some RDX and TNT dietary risks due to nondetects

Table 7-123. Risk Description and Interpretation: SWMU 45 - Stormwater Discharge Area (continued)

SWMU 45	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Mule Deer HI=0.4C HI=0.04H	None	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=4.0C HI=0.4H	Al (5) Diox (7) Fe (25) RDX (33) TNT (10)	None	Soil (38%) Diet (62%)	NA	Potential low risk	•Common prey item	•Site could provide intermittent exposures	•Several COPCs •Dioxin risks uncertain (based on 1 study) •Some RDX dietary risks due to nondetects •Low relative risk •1/4 of risk due to a nutrient
Kit Fox HI=0.4C HI=0.04H	None	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=189.6C HI=128.1H	Cr (85) Fe (9)	Cr (96)	Direct contact (100%)	Direct contact (100%)	Potential moderate risk	•Important prey base	•Site could support populations	•Cr risks highly uncertain
Plants HI=72.7C HI=47.7H	Al (28) As (5) PAH (8) Tl (24) V (15) Zn (10)	As (10) Tl (35) V (29) Zn (15)	Direct contact (100%)	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	•Arsenic is phytotoxic •Several COPCs •Low relative risk •Thallium HQs based on nondetects (current)

[a]HI=Total absolute hazard index. [b]C=Current data. [c]H=Historic data. [d]NA=Not applicable.

Weight-of-evidence (WOE) high, and for most receptors approaches or surpasses that of the reference study area (RSA); WOE >RSA for soil fauna and plants.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors due to low relative risk. The discharge maintains a wet area, which provides more habitat diversity than would exist without the discharge.

Table 7-124. Risk Description and Interpretation: SWMU 46 - Used Oil Dumpsters

SWMU 46	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Passerines HI[a]=34.6H[b]	Not sampled	Cr (19) Fe (31) Pb (12) TPHC (30) Zn (5)	NA[c]	Soil (100%)	Potential low risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site too small to support populations	•Cr not as toxic under field conditions as would be expected •Fe and Zn are nutrients •TPHC expected to biodegrade [d]
Am. Kestrel HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=5H	Not sampled	Fe (90) Pb (6)	NA	Soil (100%)	Potential low risk	•Important prey item •Represents Special Status species	•Site too small to support populations	•Fe is a nutrient
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=109.7H	Not sampled	Cr (82) Fe (16)	NA	Direct contact (100%)	Potential moderate risk	•Important prey base	•Site too small to support relevant populations	•Cr risks based on one study (weak) •Fe is a nutrient

Table 7-124. Risk Description and Interpretation: SWMU 46 - Used Oil Dumpsters (continued)

SWMU 46	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=7.2H	Not sampled	As (9) Cd (11) Cr (7) Cu (5) Hg (7) Pb (7) Sb (5) Zn (50)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site too small to support relevant populations	•Numerous COPCs •Low relative risk •Over 50% of risk is due to nutrients

[a]HI= Total absolute hazard index. [b]H=Historic data. [c]NA=Not applicable.

Weight-of-evidence (WOE) above average for most receptors; all WOE < reference study area (RSA) except for soil fauna (WOE = RSA WOE); this was primarily a result of fewer samples. Absence of dietary intakes may underestimate risk.

[d]Benzene; 47% degraded in 10 weeks; toluene: >90% degrades in soil within 4 weeks; xylenes: 70% degraded within 10 days (Howard 1991)

Conclusions: This area is not likely to pose excessive or unacceptable ecological risks to TEAD receptors based on the low relative risk for all receptors except soil fauna.

Table 7-125. Risk Description and Interpretation: SWMU 47 - Boiler Blowdown Areas

SWMU 47	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	Current	Historic	Current	Historic		Ecological	Spatial	Toxicological
Passerines HI[a]=197.7H[b]	Not sampled	Pb (6) TPHC (93)	NA[c]	Soil (100%)	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represent Special Status species	•Site too small to support populations	• TPHC expected to biodegrade [d]
Am. Kestrel HI=0.04H	Not sampled	None	NA	NA	NA	NA	NA	NA
Great Horned Owl HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Golden Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Bald Eagle HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Deer Mouse HI=5H	Not sampled	Pb (34) Sb (8) TPHC (57)	NA	Soil (100%)	Potential low risk	•Important prey item •Represents Special Status species	•Site too small to support populations	• TPHC expected to biodegrade
Mule Deer HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Jackrabbit HI=0.02H	Not sampled	None	NA	NA	NA	NA	NA	NA
Kit Fox HI=0H	Not sampled	None	NA	NA	NA	NA	NA	NA
Soil Fauna HI=0.5H	Not sampled	Hg (22) Pb (86)	NA	Direct contact (100%)	Potential low risk	•Important prey base	•Site too small to be relevant	NA

Table 7-125. Risk Description and Interpretation: SWMU 47 - Boiler Blowdown Areas (continued)

SWMU 47	Risk Drivers (% COPC contribution)		Driving Pathway		Risk Interpretation	Relevance		
Receptor	*Current*	*Historic*	*Current*	*Historic*		*Ecological*	*Spatial*	*Toxicological*
Plants HI=2.6H	Not sampled	Hg (14) Pb (20) Sb (66)	NA	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support small populations	NA

[a]HI= Total absolute hazard index. [b]H=Historic data. [c]NA=Not applicable.

Weight-of-evidence (WOE) low for all receptors and all WOE < reference study area (RSA); this was primarily a result of fewer samples. Absence of dietary intakes may underestimate risk.

Conclusions: This area is unlikely to pose excessive or unacceptable ecological risks to TEAD receptors.

[d]Benzene; 47% degraded in 10 weeks; toluene: >90% degrades in soil within 4 weeks; xylenes: 70% degraded within 10 days (Howard 1991)

Table 7-126. Risk Description and Interpretation: Ecological Study Area (ESA) 1

ESA 1 / Receptor	Risk Drivers (% COPC contribution) Current	Driving Pathway Current	Risk Interpretation	Relevance: Ecological	Relevance: Spatial	Relevance: Toxicological
Passerines HI[a]=202.3C[b]	Cd (5) Cr (10) Diox (5) Fe (11) Pb (23) Tl (24) Zn (7)	Soil (74%) Diet (26%)	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support small populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Numerous COPCs •Thallium HQs based on nondetects •Some dioxin soil ingestion risks due to nondetects •Some dioxin dietary risks due to nonodetects
Am. Kestrel HI=2.4C	Cd (7) Cr (10) Diox (5) Fe (11) Pb (11) Tl (20) Zn (18)	Soil (54%) Diet (46%)	Potential low risk	•Represents Special Status species	•Site large enough to support small populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Numerous COPCs •Thallium HQs are based on nondetects
Great Horned Owl HI=0.1C	None	NA[c]	NA	NA	NA	NA
Golden Eagle HI=0.2C	None	NA	NA	NA	NA	NA
Bald Eagle HI=0.2C	None	NA	NA	NA	NA	NA
Deer Mouse HI=90.3C	Al (7) Ba (7) Diox (7) Fe (22) Pb (7) RDX (13) Sb (7) Tl (6) TNT (7)	Soil (45%) Diet (55%)	Potential low risk	•Represents Special Status species •Important prey item	•Site large enough to support small populations	•Numerous COPCs •Dioxin risks uncertain (based on 1 study) •Thallium HQs are based on nondetects
Mule Deer HI=3.3C	Ba (11) Diox (7) Fe (18) Pb (9) RDX (24) Sb (6) TNT (8)	Soil (31%) Diet (69%)	Potential low risk	•No similar Special Status species	•Site large enough to support small populations	•Numerous COPCs •Low absolute risk •Dioxin risks uncertain (based on 1 study)
Jackrabbit HI=35.6C	Ba (12) Diox (8) Fe (18) Pb (9) RDX (24) Sb (6) TNT (8)	Soil (31%) Diet (69%)	Potential low risk	•Common prey item	•Site large enough to support small populations	•Numerous COPCs •Dioxin risks uncertain (based on 1 study)

Table 7-126. Risk Description and Interpretation: Ecological Study Area (ESA) 1 (continued)

ESA 1	Risk Drivers (% COPC contribution)	Driving Pathway	Risk Interpretation	Relevance		
Receptor	*Current*	*Current*		*Ecological*	*Spatial*	*Toxicological*
Kit Fox HI=2.1C	Al (6) Diox (14) Fe (27) Pb (24) Sb (8) Tl (6)	Soil (53%) Diet (47%)	Potential low risk	•Represents Special Status species	•Site large enough to support populations	•Numerous COPCs •Dioxin risks uncertain (based on 1 study) •Thallium HQs are based on nondetects
Soil Fauna HI=98.1C	Cr (81) Fe (11)	Direct contact (100%)	Potential low risk	•Important prey base	•Site large enough to support populations	•Cr risks uncertain
Plants HI=83.5C	Al (15) PAH (6) Sb (31) Tl (20) V (10) Zn (5)	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support populations	•Numerous COPCs •Thallium HQs are based on nondetects •Some PAH risk due to nondetects

[a]HI=Total absolute hazard index. [b]C=Based on current data set. [c]NA=Not applicable.

Conclusions: Risks to populations not expected based on low relative risks (≤ 3 times greater than the RSA). Impacts to population sustainability not expected based on low relative risks and biometric data similar to RSA.

Table 7-127. Risk Description and Interpretation: Ecological Study Area (ESA) 2

ESA 2 Receptor	Risk Drivers (% COPC contribution) *Current*	Driving Pathway *Current*	Risk Interpretation	Relevance *Ecological*	 *Spatial*	 *Toxicological*
Passerines HI[a]=273.8C[b]	Cd (5) Cr (5) Cu (5) Diox (24) Fe (14) Pb (16) Tl (18) Zn (9)	Soil (54%) Diet (46%)	Potential moderate risk	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) • Numerous COPCs •Thallium HQs are based on nondetects •Some dioxin soil ingestion risks due to nondetects •Over 1/4 of risk due to nutrients •Some dioxin and TL dietary risks due to nondetects
Am. Kestrel HI=14C	Diox (53) Fe (6) Tl (8) Zn (13)	Soil (21%) Diet (79%)	Potential low risk	•Represents Special Status species	•Site large enough to support populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Thallium HQs are based on nondetects •Almost 20% of risk due to nutrients
Great Horned Owl HI=0.7C	None	NA[c]	NA	NA	NA	NA
Golden Eagle HI=1.3C	Diox (52) Pb (18) Tl (5) Zn (10)	Soil (18%) Diet (82%)	Potential low risk	•Special Status species	•Site could contribute habitat	•Thallium HQs are based on nondetects •Dioxin risks uncertain (based on 1 study)
Bald Eagle HI=1.3C	Diox (52) Pb (18) Tl (5) Zn (10)	Soil (18%) Diet (82%)	Potential low risk	•Special Status species	•Site could contribute habitat	•Thallium HQs are based on nondetects •Dioxin risks uncertain (based on 1 study)
Deer Mouse HI=309.9C	Diox (25) Fe (10) RDX (49)	Soil (16%) Diet (84%)	Potential high risk	•Represents Special Status species •Important prey item	•Site large enough to support populations	•Dioxin risks uncertain (based on 1 study)
Mule Deer HI=32C	Diox (12) Fe (7) RDX (71)	Soil (9%) Diet (91%)	Potential low risk	•No similar Special Status species •Receptor is a large herbivore; munitions in diet drive risk	•Site large enough to support populations	•Dioxin risks uncertain (based on 1 study)

Table 7-127. Risk Description and Interpretation: Ecological Study Area (ESA) 2 (continued)

ESA 2	Risk Drivers (% COPC contribution)	Driving Pathway	Risk Interpretation	Relevance		
Receptor	*Current*	*Current*		*Ecological*	*Spatial*	*Toxicological*
Jackrabbit HI=195.6C	Diox (12) Fe (7) RDX (71)	Soil (9%) Diet (91%)	Potential high risk	•Common prey item •Small herbivore; munitions in diet drive risk.	•Site large enough to support populations	•Dioxin risks uncertain (based on 1 study)
Kit Fox HI=19C	Diox (72) Fe (10) Pb (6)	Soil (17%) Diet (83%)	Potential low risk	•Represents Special Status species •Omnivore/carn-ivore; dioxins in diet drive risk	•Site large enough to support populations	•Dioxin risks uncertain (based on 1 study)
Soil Fauna HI=87.3C	Cr (58) Cu (10) Fe (22)	Direct contact (100%)	Potential low risk	•Important prey base	•Site large enough to support populations	•Cr risks uncertain •Over 30% of risk due to nutrients
Plants HI=71.6C	Al (15) Cu (10) PAH (19) Tl (24) V (10) Zn (8)	Direct contact (100%)	Potential low risk	•Plants provide community structure/ habitat	•Site large enough to support populations	•Several COPCs •Low relative risk •Thallium HQs are based on nondetects

[a]HI=Total absolute hazard index. [b]C=Current data. [c]NA=Not applicable.

Conclusions: Risks to small mammals and herbivores may occur in this ESA. Given that there is high risk relative to the RSA, some impacts on herbivorous mammals could be observed on a localized basis.

Table 7-128. *Risk Description and Interpretation: Reference Study Area (RSA)*

RSA Receptor	Risk Drivers (% COPC contribution) Current	Driving Pathway Current	Risk Interpretation	Relevance: Ecological	Relevance: Spatial	Relevance: Toxicological
Passerines HI[a]=125.3C[b]	Cr (7) Diox (15) Fe (17) Tl (39) Zn (7)	Soil (72%) Diet (28%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Some passerines are permanent residents and thus are chronically exposed •Represents Special Status species	•Site large enough to support populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Risks indicative of ambient conditions •Thallium HQs are based on nondetects •Some dioxin soil ingestion risks due to nondetects
Am. Kestrel HI=12.9C	Cr (6) Diox (28) Fe (12) Se (6) Tl (22) Zn (16)	Soil (39%) Diet (61%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Represents Special Status species	•Site large enough to support populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) • Risks indicative of ambient conditions •Thallium HQs are based on nondetects
Great Horned Owl HI=4.0C	Cr (8) Diox (7) Fe (14) Pb (19) Se (9) Tl (25) Zn (11)	Soil (46%) Diet (54%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Represents Special Status species	•Site large enough to support populations	•Risks indicative of ambient conditions •Dioxin risks uncertain (based on 1 study) •Thallium HQs are based on nondetects •Fe, Se, and Zn are nutrients
Golden Eagle HI=8.1C	Cr (8) Diox (7) Fe (14) Pb (15) Se (9) Tl (31) Zn (11)	Soil (51%) Diet (49%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Special Status species	•Site large enough to support populations	•Risks indicative of ambient conditions •Dioxin risks uncertain (based on 1 study) •Thallium HQs are based on nondetects •Fe, Se, and Zn are nutrients

Table 7-128. Risk Description and Interpretation: Reference Study Area (RSA) (continued)

RSA Receptor	Risk Drivers (% COPC contribution) Current	Driving Pathway Current	Risk Interpretation	Relevance Ecological	 Spatial	 Toxicological
Bald Eagle HI=8.0C	Cr (8) Diox (7) Fe (14) Pb (15) Se (9) Tl (31) Zn (11)	Soil (51%) Diet (49%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Special Status species	•Site large enough to support populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) • Risks indicative of ambient conditions •Thallium HQs are based on nondetects •Fe, Se, and Zn are nutrients
Deer Mouse HI=90.2C	Al (8) Diox (24) Fe (24) RDX (11) Tl (6) TNT (13)	Soil (32%) Diet (68%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Represents Special Status species •Important prey item	•Site large enough to support populations	•Thallium risks highly uncertain •Dioxin risks uncertain (based on 1 study) •Risks indicative of ambient conditions •Thallium HQs are based on nondetects •Some dioxin, RDX, and TNT dietary risks due to nondetects •Almost 1/4 of risk is due to a nutrient
Mule Deer HI=12.7C	Al (6) Diox (11) Fe (23) RDX (26) TNT (17)	Soil (27%) Diet (73%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•No similar Special Status species •Large herbivore • Results show herbivores more at risk due to munitions in diet.	•Site large enough to support populations	•Risks indicative of ambient conditions •Dioxin risks uncertain (based on 1 study) •Some RDX and TNT dietary risks due to nondetects
Jackrabbit HI=35.2C	Al (5) Diox (11) Fe (23) RDX (27) Tl (5) TNT (17)	Soil (27%) Diet (73%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Common prey item •Small herbivore •Results show herbivores more at risk due to munitions in diet	•Site large enough to support populations	•Risks indicative of ambient conditions •Dioxin risks uncertain (based on 1 study) •Thallium HQs are based on nondetects •Some RDX and TNT dietary risks due to nondetects

Table 7-128. Risk Description and Interpretation: Reference Study Area (RSA) (continued)

RSA	Risk Drivers (% COPC contribution)	Driving Pathway	Risk Interpretation	Relevance		
Receptor	*Current*	*Current*		*Ecological*	*Spatial*	*Toxicological*
Kit Fox HI=95.2C	Al (9) Diox (30) Fe (36) Pb (5) Tl (8)	Soil (46%) Diet (54%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Represents Special Status species	•Site large enough to support populations	•Risks indicative of ambient conditions •Dioxin risks uncertain (based on 1 study) •Thallium HQs are based on nondetects •Some dioxin, RDX, and TNT dietary risks due to nondetects •Some dioxin soil ingestion risks due to nondetects
Soil Fauna HI=45.5C	Al (7) Cr (68) Fe (23)	Direct contact (100%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Important prey base	•Site large enough to support populations	•Risks indicative of ambient conditions
Plants HI=41C	Al (30) Tl (42) V (16)	Direct contact (100%)	Given that the RSA is a reference area, HQs >1 suggest that the TBVs for these COPCs are too low for this site.	•Plants provide community structure/ habitat	•Site large enough to support populations	•Risks indicative of ambient conditions •Thallium HQs are based on nondetects

[a]HI=Total absolute hazard index. [b]C=Based on current data set.

Conclusions: Risks at the RSA are, by definition, not related to TEAD. The metal and dioxin concentrations reflect ambient conditions. However, munitions are anomalous, and may reflect air borne deposition on RSA vegetation from TEAD activities.

Al, Cr, Fe, Pb, Se, Tl, V, and Zn have HQs in excess of one. These are not likely to affect population sustainability, since they are based on NOAEL values for TBVs. Adverse effects begin at intakes six to 10 or more times higher than the NOAELs, once LOAEL values and uncertainty factors are accounted for. The dioxins are NOAEL-based values with UFs of 15 or more; LOAELs were not recorded. The munitions are based on NOAELs with UFs of 5 or more. Therefore, effects on individuals locally are not expected at HQs less than 10, and effects on populations are not expected at the RSA based on the biometric data.

Table 7-129. Ranges of HIs for TEAD Receptors by Location for Sites With Unacceptable or Excessive Ecological Risks - Based on Historic Data

Location/SWMU		**RSA**			**1**			**8**			**10**	
Range of HIs	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +
Receptor												
Passerines	—	90.2	—	—	—	643.2	—	—	304.8	1.7	—	—
American Kestrel	5	—	—	—	19.9	—	—	—	—	—	—	—
Great Horned Owl	1.8	—	—	—	—	—	—	—	—	—	—	—
Golden Eagle	4.1	—	—	1.3	—	—	—	—	—	—	—	—
Bald Eagle	4.1	—	—	1.3	—	—	—	—	—	—	—	—
Deer Mouse	—	28.4	—	—	—	186.8	—	65.8	—	—	35.8	—
Mule Deer	3.5	—	—	—	16.7	—	—	—	—	—	—	—
Jackrabbit	9.5	—	—	—	53	—	—	—	—	—	—	—
Kit Fox	—	44	—	—	15.4	—	—	—	—	—	—	—
Plants	—	41	—	—	—	605.6	—	35.3	—	—	—	137.2
Soil Fauna	—	45.5	—	—	—	200	—	83.8	—	—	—	—

Location/SWMU		**RSA**			**11**			**12**			**15**	
Range of HIs	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +
Receptor												
Passerines	—	90.2	—	—	—	397.6	5	—	—	—	—	211.7
American Kestrel	5	—	—	—	—	—	—	—	—	2.4	—	—
Great Horned Owl	1.8	—	—	—	—	—	—	—	—	—	—	—
Golden Eagle	4.1	—	—	—	—	—	—	—	—	—	—	—
Bald Eagle	4.1	—	—	—	—	—	—	—	—	—	—	—
Deer Mouse	—	28.4	—	—	—	130.1	—	—	—	—	41.7	—
Mule Deer	3.5	—	—	—	—	—	—	—	—	1.3	—	—
Jackrabbit	9.5	—	—	3.6	—	—	—	—	—	—	14.4	—
Kit Fox	—	44	—	—	—	—	—	—	—	1.4	—	—
Plants	—	41	—	—	—	100	1.8	—	—	—	44.3	—
Soil Fauna	—	45.5	—	—	—	233.1	—	—	—	—	—	627.2

Location/SWMU		**RSA**			**21**			**42**	
Range of HIs	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +
Receptor									
Passerines	—	90.2	—	—	—	1047.5	—	—	875.4
American Kestrel	5	—	—	—	—	—	3.7	—	—
Great Horned Owl	1.8	—	—	—	—	—	—	—	—
Golden Eagle	4.1	—	—	—	—	—	—	—	—
Bald Eagle	4.1	—	—	—	—	—	—	—	—
Deer Mouse	—	28.4	—	—	—	134.1	—	—	168.8
Mule Deer	3.5	—	—	—	—	—	3.8	—	—
Jackrabbit	9.5	—	—	—	—	—	—	41.3	—
Kit Fox	—	44	—	—	—	—	3.9	—	—
Plants	—	41	—	—	—	2024.3	—	—	194.3
Soil Fauna	—	45.5	—	—	—	3470.2	—	—	307.3

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Table 7-130. Ranges of HIs for TEAD Receptors by Location for Sites With Unacceptable or Excessive Ecological Risks - Based on Current Data

Location/SWMU	RSA			10			11			12		
Range of HIs	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +
Receptor												
Passerines	—	125.3	—	—	—	151.6	—	—	505.6	—	—	156.4
Am. Kestrel	—	12.9	—	—	—	—	—	—	—	2.3	—	—
Great Horned Owl	4	—	—	—	—	—	—	—	—	—	—	—
Golden Eagle	8.1	—	—	—	—	—	—	—	—	—	—	—
Bald Eagle	8	—	—	—	—	—	—	—	—	—	—	—
Deer Mouse	—	90.2	—	—	—	1543.2	—	—	175.2	—	50.4	—
Mule Deer	—	12.7	—	4.8	—	—	—	—	—	—	—	—
Jackrabbit	—	35.2	—	—	52.4	—	4.4	—	—	5.9	—	—
Kit Fox	—	95.2	—	—	—	—	1.4	—	—	2.5	—	—
Plants	—	41	—	—	30.2	—	—	55.2	—	—	33.9	—
Soil Fauna	—	45.5	—	—	24.9	—	—	—	120.3	—	38	—

Location/SWMU	RSA			15			21			42		
Range of HIs	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +	1 to 10	10 to 100	100 to 1000 +
Receptor												
Passerines	—	125.3	—	—	—	366.7	—	—	148.3	—	—	239.3
Am. Kestrel	—	12.9	—	9.4	—	—	—	—	—	4.5	—	—
Great Horned Owl	4	—	—	—	—	—	—	—	—	—	—	—
Golden Eagle	8.1	—	—	—	—	—	—	—	—	—	—	—
Bald Eagle	8	—	—	—	—	—	—	—	—	—	—	—
Deer Mouse	—	90.2	—	—	—	152.9	—	61.8	—	—	83.8	—
Mule Deer	—	12.7	—	5.4	—	—	—	—	—	2.8	—	—
Jackrabbit	—	35.2	—	—	58.6	—	—	—	—	—	29.9	—
Kit Fox	—	95.2	—	—	10.7	—	—	—	—	7.9	—	—
Plants	—	41	—	—	—	177.4	—	65.5	—	—	84.7	—
Soil Fauna	—	45.5	—	—	—	224.7	—	67.3	—	—	46.8	—

SEC7MORE.XLSCurrent11/20/97

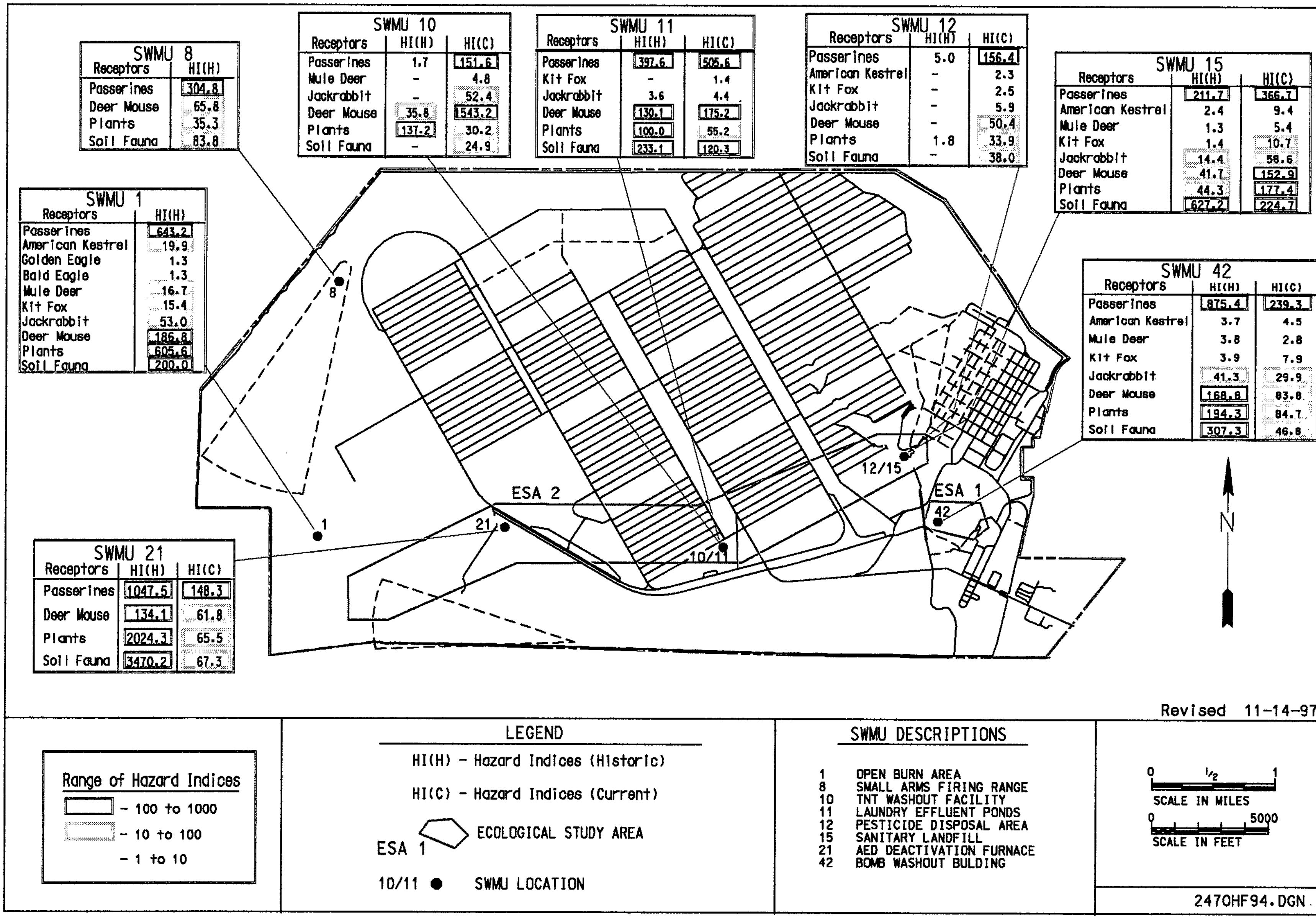

Figure 7-27. Hazard Indices for TEAD SWMUs With Unacceptable or Excessive Ecological Risks

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